



INTERNATIONALE VEREINIGUNG DER BERGFÜHRERVERBÄNDE
INTERNATIONAL FEDERATION OF MOUNTAIN GUIDES ASSOCIATIONS
UNION INTERNATIONALE DES ASSOCIATIONS DE GUIDES DE MONTAGNE
UNION INTERNACIONAL DE ASOCIACIONES DE GUIAS DE MONTAÑA

MANUAL

TREKKING & EXPEDITIONS

A teaching aid produced by the IFMGA / UIAGM / IVBV

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www.ivbv.info | contact@ivbv.info



Foreword

Modern work patterns and lifestyles have given climbers, trekkers and nature lovers the mobility, time and financial resources to travel worldwide throughout the year. Many rely on commercial companies or individuals to plan and support their endeavours. The professional organisation and implementation of an expedition or trek requires a broad set of skills and expertise.

Over many decades, trained mountain guides have accompanied, served and guided their guests to some of the most remote corners of the earth. The International Federation of Mountain Guides Associations (IFMGA) has provided a forum through which knowledge can be exchanged by its members since its founding in 1965. The IFMGA Technical Committee is responsible for setting the professional standards of its members and ensuring that they are maintained. It also develops training methods and tools to help countries achieve these standards.

This document has been created by the IFMGA 'Trekking and Expeditions' subcommittee. It forms a policy framework around which member countries and their Guides can structure their training and refresher courses. Mountain guides from around the world have been involved in its development and a great deal of practical knowledge and field tested experience can be found within its pages.

This Manual provides guidance aimed at supporting the preparation, organisation and execution of professionally lead treks and expeditions. Specific knowledge required for remote and high altitude medical care has also been included. It has been drawn together through the hard work and diligence of all subcommittee members.

This document is a valuable reference material for professional mountain guides and will in turn benefit both their clients and their own safety. It is my sincere hope that guides will frequently refer to this document and that as a result the quality of their professional work will continue to improve.

My sincere thanks must go to everyone who has participated in the development of this Manual, their knowledge and passion have been invaluable. In particular I would like to thank Walter, the president of the subcommittee, for his tireless commitment, dedication and the time that he invests in the IFMGA.

Peter Kimmig, IFMGA Mountain Guide
President Technical Commission IFMGA, 2012



Update 2022

I have had the privilege to spend 9 years on the Board of IFMGA. 8 years of them as President of the Technical Commission. Looking back on the last 9 years, I am proud of what we have been able to achieve as a TEAM in the Technical Committee. Instructor coordination with all countries from South America, a ski training for all South American countries with No SKI, basis and implementation of a first training for Eastern European countries with their own association (EEMGA), creation of the platform for canyoning, creation of a reference handbook, which sets out the training and core areas of the IFMGA mountain guide, a solid platform that describes in detail the entire training of an IFMGA mountain guide and represents the training basis for all 27 IFMGA member countries and at the same time provides the guide for new countries.

With the new Trekking & Expeditions Manual, the revision of another milestone has been achieved. For many decades, trained mountain guides have accompanied, cared for and guided their guests to the remotest corners of the earth. Since its founding in 1965, the International Federation of Mountain Guides Associations (IFMGA) has provided a forum for the exchange of knowledge among its members. The IFMGA Technical Committee is responsible for setting the professional standards of its members and ensuring that they are met. It also develops training methods and tools to help countries achieve these standards.

This document was prepared by the IFMGA Trekking and Expeditions Subcommittee. It provides a policy framework upon which member countries and their mountain guides can structure their training and refresher courses. Mountain guides from all over the world have been involved in the development of the manual, and much of the practical knowledge and experience gained in the field is included in this manual. This shows once again the importance of joint collaboration and sharing among our large IFMGA family.

This manual is a guide that supports the preparation, organization and implementation of professionally guided hikes and expeditions. It also addresses the specific knowledge required to provide medical care in remote areas and at high altitudes. It was put together through the hard work and diligence of all the subcommittee members. In addition, there are structured lessons on how to incorporate knowledge of this area into training in each country.

Many thanks to all for their tireless assistance in all IFMGA projects.

Reiner Taglinger, IFMGA Mountain Guide
President Technical Committee, 2022



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1. Before the Trip

1.1 Information for the Client

A well written itinerary simplifies communication with clients while also providing a professional image.

Thorough research of trip details and also highlight any possible problems that might occur. This allows plenty of time for contingency planning.

Clients should be provided with all the details concerning the technical and physical demands of the trek/expedition. In addition, they should receive general information such as travel dates, itinerary, price, included services, additional costs and entry formalities, etc.

In accordance to the IFMGA guidelines the category of the trip should be communicated.

Clear details of the physical and technical demands is vital. This should include a comparison chart against well-known treks/climbs to help clients evaluate their own ability and preparedness. The clearer and more detailed the information provided, the greater the clients understanding will be of the activities involved. Consequently, time spent answering direct client questions or providing guidance will be much reduced. Some providers have processes in place and use search forms on their websites that preselect trips for their clients. The client inputs select criteria and a search engine on the website selects and displays a list of recommended journeys according to these criteria.

Statements about planned procedures in case of an emergency, illness, accident, refund policies, etc. (return of the whole team, assistance to other climbers,...) have to be included to prevent later troubles.

NOTE:

Accurate and clear information provided well in advance of the departure forms the foundation of a successful Trek/Expedition. This helps to ensure that the clients' skill level matches the undertaking and that their expectations are met.

1.2 Selection and preparation of the participants

The tour operator/mountain guide is responsible for the final selection of participating clients. It is standard to ask the client/s to provide detailed information concerning experience they have gained on previous tours/climbs. This provides basic



information but it is important to be aware of the subjective personal assessment that each individual makes when submitting their prior experience.

Many tour operators/mountain guides meet with their clients before the trip, usually in the premises of the tour operator. All relevant issues can usually be addressed at this point. It is not possible prior to the trip to assess what the client/s skill level in the field will be, how their behaviour will fit within the group or if their camp experience is sufficient. Thus, it is highly recommended to have previous experience in the field with clients in advance of the trip. This would ideally involve an overnight camp or bivouac. This is the only way to ensure a comprehensive assessment of the clients including their strengths and weaknesses.

This initial assessment can provide an opportunity for the tour operator/mountain guide to give specific training or advice on any physical or technical skills the client/s may require in advance of the trip.

Inquiry of the clients goals, motivations and family background, etc. are all recommended. These preparations in advance help ensure that client's goals are met, they have a safer experience and better chance for summiting the mountain or completing the trek. It also gives the tour operator/expedition leader the opportunity to make a more objective selection regarding any exclusion criteria.

In addition to standard terms and conditions, a detailed expedition contract is recommended that includes all associated risks as part of the booking documents.

See section 1.4.1 for details.

For easy trekking trips the requirements do not need to be as detailed, as to the discretion of the guide/operator.

1.3 Selection of the mountain guide/expedition leader

The trek/expedition leader or mountain guide has a key role within the group. They retain overall responsibility for the safety of the entire team during the course of the trip. They are responsible for steering the group dynamics in a good direction, reinforcing positive interactions and cutting off negative ones. They form the link between the clients and the staff. They have important administrative tasks, for example: resolving issues with local authorities, medical care of the porters, monitoring hygiene in the kitchen, assessment of the capacity and health of the



clients. They also have overall responsibility for operational tasks, for example the installation and maintenance of fixed ropes, the installation and resupply of high camps and the coordination and guiding of rope-teams on the mountain.

It is easy to underestimate the complexity of this management function. The IFMGA Sub-committee for High Altitude Mountaineering has created guidelines (see Appendix) that should make it easier to understand the required qualities for a leader. The level of challenge and complexity of any given trek/expedition will determine how much previous experience the Leader should have. For example, a well-established trip to a known area where the Leader is supported by a tested in-country agency could be led by someone with less previous experience than an exploratory trip to a remote area with complicated logistical issues.

Aside from the technical skills and personal experience at high altitude it is often the Leaders' "soft skills" that determines how effective they are in their leadership role. That is why this Manual focuses on trek/expedition logistics and the psychological components of expedition leadership. Technical information concerning safeguarding a party in mountainous terrain is covered in standard national training.

NOTE:

The key to a successful Trek/Expedition is in choosing the right Leader/ Mountain guide and their "leadership qualities".

1.4 Legal basis (Travel laws)

Many countries have a wide range of laws concerning the travel industry which exist alongside any laws relating specifically to mountain guides. Sometimes small organisations and individuals planning expeditions are unaware of these additional laws. This can, and has had unfortunate and important legal liability implications.

Example: An alpine school organised a trip to climb Kilimanjaro. After a successful ascent of the mountain a four day safari in Tanzania was also sold to the clients. During this safari there was a car accident in which two clients were injured. The clients sued, and made the alpine school the focus of their claim for damages. The Liability Insurance of the alpine school covered claims for damages related to



mountaineering activities but not traffic accidents. The manager of the alpine school was not aware of the risk that this exposed them to and had not arranged a special insurance to cover the actions of tour operator (in this case a Safari company in Tanzania). The clients sued the alpine school in relation to the car accident and the alpine school sought to recover the costs from the Safari Company. However even though the alpine school was in theory legally able to try to recover costs from the safari company, in practice because the safari company did not have sufficient funds, the alpine school had to pay all the damages to the clients without being able to recover any costs from the safari company.

Different national laws make it difficult to get precise information about all legal liabilities. Thus, we strongly recommend studying the travel laws in detail and obtaining respected in-country advice on all aspects of the itinerary. It is very important to ensure that adequate insurance cover is in place before the journey. In German-speaking countries in order to sell worldwide travel packages you must have a tour operator licence and additional liability insurance in place. You must also confirm to specific European Insurance Regulations. This requirement far exceeds the normal Liability Insurance of a mountain guide. Taking out adequate Liability Insurance to cover all aspects of the proposed itinerary is the only way to ensure that the tour operator is not liable from their own funds in the event of damages being awarded against them. Such damages could result from many more potential sources on worldwide travel packages, for example the insolvency of an airline or other service provider and consequently stranded clients.

1.4.1 Topics to be agreed before expedition starts (Expedition contract)

The following details should be agreed to by the tour operator/mountain guide and client/s prior to the start of the expedition. It is recommended that they are included in a specific expedition contract.

1. Financial arrangements:

1.1. Agreement that client/s jointly cover additional unpredicted costs during expedition (e.g. necessity to cover additional fees of local authorities, sherpas, or



transportation, which were incurred by local operators despite prior fixed arrangements).

- 1.2. Agreement that any loss of personal equipment used for the purpose of the expedition is jointly covered by the client/s (e.g. tent and sleeping bags left in the last base camp).
- 1.3. Agreement that any personal loss of equipment incurred by another participant or the entire expedition is necessary for completion of the expedition.
- 1.4. Agreement to release the tour operator/mountainguide from liability and financial consequences which resulted from the change of air connections, or losses due to actions of airline operators or operators of other means of transport.
- 1.5. Agreement that client/s will cover or incur any losses or stolen equipment of any participant.

2. **Health Protection Arrangements**

- 2.1 Client/s should be advised to get basic medical tests prior to expedition.
- 2.2 Client/s should be informed in advance of any limited access to medical services during the expedition.
- 2.3 Client/s should be informed on the remote nature of the expedition and any technical limitations that may result in delayed evacuation procedures.
- 2.4 Client/s should agree to inform the expedition leader of; 1) any medical issues ahead of and/or during the expedition, and 2) discuss any and all medications required by the client/s before and during the expedition.
- 2.5 Requirement to perform tools like for example the "TrexCheck"(see Appendix)
- 2.6 Inform the client/s that their insurance may not cover additional costs of medical treatment or evacuation. It is their responsibility to insure their coverage is adequate. Many tour operators recommend specific trip insurance that provides additional coverage.
- 2.7 In the event that client/s have chronic diseases or medical conditions, such as asthma, diabetes, heart conditions, blood pressure disorders, etc.) it is recommended that the tour operator/mountain guide requires a letter from the client/s physician stating their ability to participate in the expedition activities.

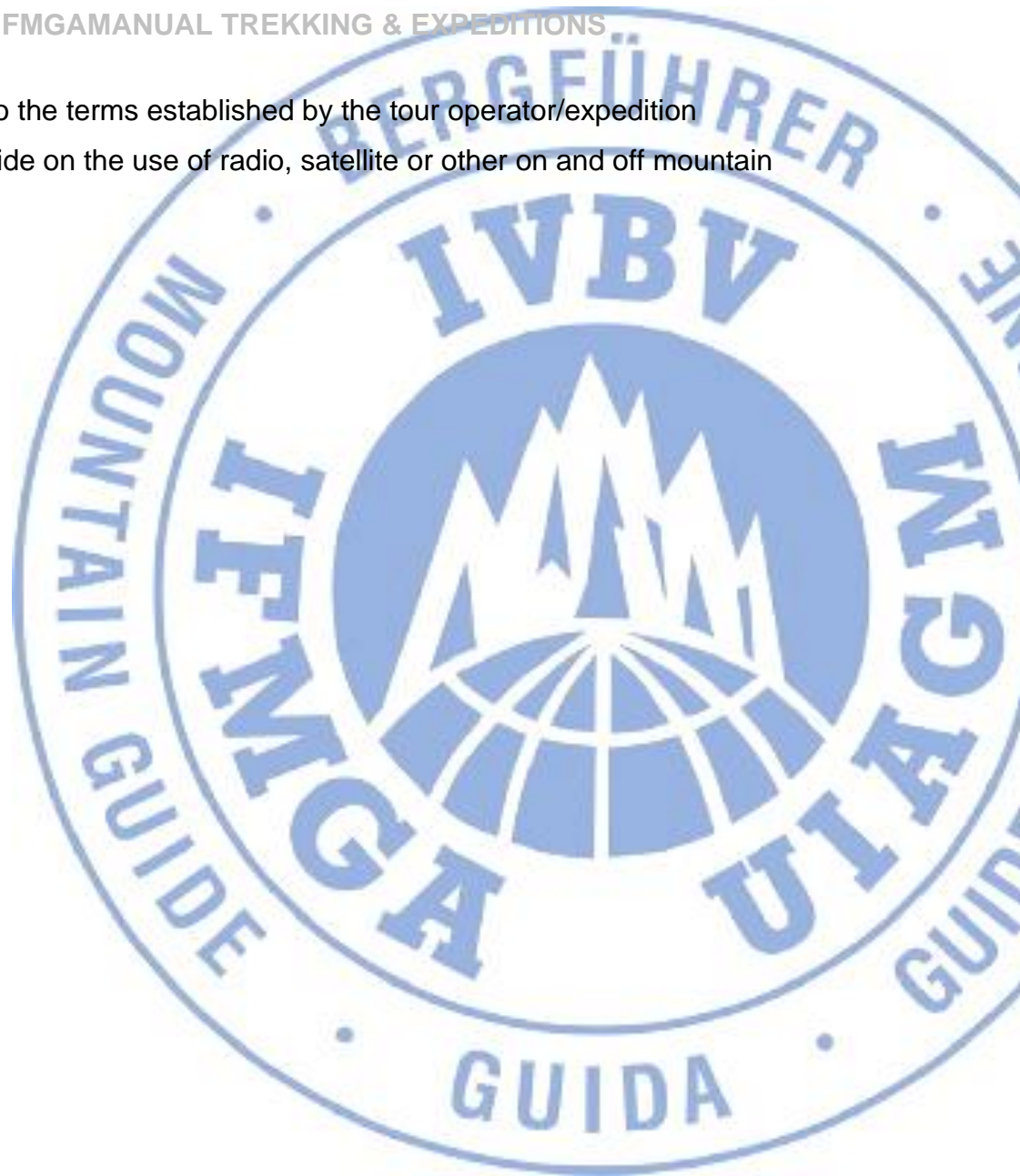
3. **Discipline and organization during the expedition**



- 3.1 Agreement that the primary aim of the expedition is the safety of all participants in maximizing chances for each participant to reach the summit, however there is no guarantee that the summit will be possible.
- 3.2 Agreement that the client/s understands and accepts all risks of the trip and also understands that the expedition leader can not eliminate all risk. Many countries and tour operators/mountain guides require "risk waivers" or "release of liability" forms as part of the pre-expedition booking process.
- 3.3 Client/s understand that they themselves and/or the mountain guide/expedition leader may need to participate in a rescue situation of another expedition or individual which may lead to the interruption or possible termination of their own expedition.
- 3.4 Client/s agree to the terms that the mountain guide/expedition leader has the discretion and decision at any time on the expedition to determine who has a summit attempt, if any client/s need to descend, or if anyone is not allowed to go above any camp for any reason, etc. This is particularly regarding health, fitness or technical ability issues of the client/s, weather or route conditions and group dynamics but not limited to the above.
- 4 Agreement that the mountain guide/expedition leader will determine movement up or down the mountain of each client/s and with regard to who they climb or descend with, or if they are to stay in place. Consent that there will be no solo travel by clients or staying alone in any camp during the expedition.
 - 4.1 Agreement that the mountain guide/expedition leader determines all rules and authority during summit attempts including withdrawal for any reason not limited to; slow pace, not being in position at an established time or place, poor route conditions, inaccurate weather forecast, altitude sickness, poor fitness or loss of radio connection.
 - 4.2 Agreement to come prepared with all the required equipment for the expedition and using equipment determined by the mountain guide/expedition leader at any stage of the expedition.
 - 4.3 Understanding and agreement to conditions beyond the expedition leader/tour operator/mountain guides control during the expedition that may include but is not limited to; supply and type of available food as well as sanitary and hygienic conditions during the expedition or summit attempt.



4.4 Agreement to the terms established by the tour operator/expedition leader/mountain guide on the use of radio, satellite or other on and off mountain communication.



1.5 Equipment for trekking and expeditions

The equipment required for trekking and mountaineering expeditions further afield is not intrinsically different from similar undertakings in the Alps or any other high mountain region. However, when equipment problems are encountered in the Alps it is rare to “compromise” more than one summit. On more remote tours it becomes much more important that equipment is complete and remains functional and reliable for weeks at a time. Due to high altitude and extreme environmental conditions it is more likely that clients will demand quality from their equipment and hence buy more expensive products. It is important that clients do not experiment with new equipment for their trek/expedition. The clients should only take items that they have

NOTE: As little as possible, as much as necessary!

used previously and that have proved reliable.

Good equipment is also an important risk management consideration. It does not negate the need for good preparation but it can help critical situations to be more easily overcome or avoided. The tour operator/ mountain guide who organises/ leads the tour is an important influence on the clients when it comes to selecting the right equipment. Guides have a big influence on clients, something about waste minimization starts here. It is the first opportunity for guides to influence their clients behaviour and there is an opportunity for awareness raising. Problems with individual's equipment during the trip can impact the itinerary for the whole group and often make guiding much more difficult.

All client/s and staff equipment should be checked by the expedition leader/mountain guide prior to the trip.

1.5.1 Equipment and weight

The performance of a high altitude climber is highly influenced by the total amount of weight (body weight + weight of equipment) that they must carry. The higher the planned summit the more important it becomes to minimise this weight. This means using lightweight equipment such as titanium crampons, aluminium ice axes, lightweight backpacks, and freeze-dried food, etc. This becomes especially important



during the summit bid. We must aim for as low an overall weight as possible understanding that speed is important to safety.

In Treks, unnecessarily heavy loads have a negative effect on performance in terms of endurance. More weight leads to increased physical stress and this can trigger altitude related illness. Heavy loads should always, where possible, be given to mountain porters or domestic pack animals. The mountain guide should aim to provide transportation alternatives and ensure that their guests are not carrying too much weight.

Beware: A careful selection of items at home not only has benefits during the tour, but also at the airport where baggage weight issues are normally first encountered. Money can be saved by reducing excess baggage. The important question is: What do I absolutely need? And not: What could I need?

Any packaging or tags from new equipment or food should be removed in advance of the trek/expedition so as not to increase unnecessary expedition waste on the mountain or trek.

1.5.2 Clothing

Significant heat loss in the High Mountains is often underrated. If the heat loss cannot be minimized by means of appropriate clothing or compensated for by physical activity it can lead to hypothermia or frostbite. Stays at high altitude are often accompanied by the combined effects of wind and low temperatures. In addition, our main heat source, muscle movement operates at a slower pace. Heat production in the body requires energy which is then no longer available to supply the muscles with energy for movement. This can lead to fatigue and with it further body cooling.

Therefore at high altitude the aim must be to minimize heat loss through suitable clothing. The mountain guide should always watch their clients to identify any problems early and train client/s on layering techniques to reduce perspiration while climbing and maintaining body heat at rest.

The layer principle

For treks and expeditions the layer principle applies. Several thin pieces of clothing should be worn over each other. This allows adaptation to various temperatures and weather conditions. The base layer in direct contact with the skin should be a snugly fitting "comfort layer". This should be made of wool or a functional fibre that directs sweat away from the body with the aim of keeping the skin dry. On top of this is a



thermal layer (mid-layer) made of synthetic fleece or wool that transports moisture further away from the body and also provides insulation. On the outside is the protective layer (shell-layer) designed to keep the wind and weather outside and protect the body from getting wet and cold. Often this consists of a membrane (such as GoreTex®) that is breathable (allowing body moisture to escape outwards) but wind and waterproof.

Clothing for Arrival / Return journey

In order to be well prepared for the outward and return journey it is advisable to select convenient and functional clothing. Many tours include a cultural program in cities involving overnight stays in quality hotels where it would be more pleasant to wear different clothing than your mountain gear. After many weeks spent in "technical underwear" it can be a real pleasure to put on normal clothing again. Ideally any clothing which is not required during the mountain phase of the tour can be left in the hotel. This minimises luggage during the tour but allows something fresh to wear afterwards. Some pieces of clothing or equipment such as sunhat, rain jacket or fleece pullover may be useful throughout the entire journey. For the outward and return journey you should have at least 2 sets of underwear, 2 pairs of thin socks, 1 pair of casual long trousers, 2 t-shirts, 1 casual shirt and 1 pair of casual shoes. Dark colours hide stains better than light ones.

Hand washing will never make them perfectly clean again. The clothes should be cut modestly so as to allow visits to churches, temples or other religiously sensitive sites without causing offense to the local culture. This also enables clients to feel comfortable during a nice dinner in the hotel. Shoes should not be too sporty (colourful) and should be comfortable and well-worn in. A "stroll" in ill-fitting casual footwear has often been the downfall of even the most hardened expedition mountaineer. Depending on the destination and culture clients may also be advised to pack shorts and a bathing suit for swimming, the sauna and other water based recreational activities.

NOTE:

The culture of the destination country may well determine what clothing is appropriate to take.

Clothing for Trekking and Expedition

As already mentioned above, the layer principle is recommended for clothing on treks and expeditions. The base layer should be a technical shirt which transports the sweat quickly to the outside and has a pleasant feel on the skin. Wool has the great advantage that it will not smell even after sustained use. This is an important point when you consider that hygiene conditions may be difficult and that clients are usually in very close proximity to one another in



their tent. Synthetic shirts have the advantage that they are a bit lighter than wool and that they dry faster. Normally people take more long sleeve shirts with them because they offer protection against the sun. When it gets too warm the sleeves can easily be rolled up. If clients prefer to wear a single layer (due to high temperatures) then it is a good idea if they absorb a high percentage of UV light.

The first warm layer is usually made of thin fleece (polar fleece). Fleece is originally from polyester and has particularly high thermal insulation properties for its weight even when it is wet. Different manufacturers make different products depending on the focus: super light ones, super warm, wind proof, particularly hard-wearing and water-repellent. The range of brands is large and the best thing to do is seek advice from local sports shop or distributors.

As a further warm layer or as a heat-protective-layer windproof products like Windbloc® and Windstopper® can be used. Although they are not as light as pure fleece they are windproof and sometimes even relatively water resistant. Products in this category are called soft shell - they are laminates of different layers, which combined to form a single fabric which can achieve a greater function. Whether you prefer a sweater or jacket is simply a matter of taste. Jackets are by far simpler to use but you must ensure the quality of the zippers as these are often points of failure.

Underpants and bras for women form an essential part of the clothing system. They are constantly worn

and they are not easy to replace. It is important that you do not use cotton underwear or bras. The layering system does not work properly unless all the clothing is made from high-tech fibre that direct sweat away from the body and this includes the underpants and bras. Clients must not wear wet, sweaty, cotton underwear. Almost every major manufacturer offers a good product with a comfortable fit. Different length are possible, between very long, 2/3 long or short, but the short pants should not be too short. The 2/3 underpants have the advantage that with the use of long socks and high hiking boots there are not too many layers at the top of the boot. Disposable paper underpants might be very hygienic but they are not very effective during sporting activities. Sport bras are most practical for women as opposed to types that have metal closures or adjustments and can lead to heat loss.



The various layers worn as trousers should fit together well and have a similar cut. Snug-fitting leggings can be worn both as a thermal layer and on their own during higher temperatures. Although we should be aware that not all cultures like to see people walking around in tight running pants or sport bras. Trousers made of Powerstretch fleece ® or a similar fabric offer many advantages during physical activity and they combine well with a classic mountain trouser. Makes sure you consider the practicality of pockets and that they are secured with zippers. As the final outer protective layer, waterproof over-trousers should never be left behind on any journey. Trousers with a membrane have been proven to work very well, waterproof as well as breathable. A 2-way zip across the entire leg length is necessary because you do not always want to take off your shoes if you need to change your trousers. It also is important to have a snugly fitting inner gaiter that has a tight fit around the top of the boot.

For expeditions padded over trousers are also recommended. Primaloft ® over trousers offer a great deal of warmth and are quite sturdy (water resistant). Thick down pants are only recommended for expeditions to 8.000m peaks or the Polar Regions.

Waterproof and breathable jackets are used in the Alps and other alpine regions as the classic outer layer of protection against wind and moisture. Depending on the intended use, make sure that the jackets have practical details (vents, pockets, well-designed hood, etc.) and are made of appropriate material. In humid regions a good underarm vent is important because the membrane cannot transport outwards all produced moisture. If strong winds or rain are expected, the hood must be adjustable and able to close against the elements. The jacket must be big enough so that clients can still wear a warm jacket underneath it without restricting movement.

A warm but not too thick down or Primaloft jacket is not only essential for extreme conditions when combined with a waterproof jacket, but also provides warmth during cold nights in the tent or at rest stops. A down vest is very versatile and is highly recommended.



Hats & Accessories

Hats are very important pieces of equipment to protect against unnecessary heat loss. An unprotected head and neck can account for about 50% of the heat lost from the body. The head is the part of the body that should be ventilated first when you are overheating and start to sweat. It is also the part that must have additional protection when you start to become cold. Even on trekking tours you should have at least two hats. A light, comfortable hat and a warmer, windproof hat that can cover the ears and worn over the light hat. Whether you use wool or synthetic fibres is a personal choice. The comfort of the lightweight hat is very important because you have to be able to sleep in it. For expeditions a balaclava and /or a face mask to protect against wind and weather should also be taken. Depending on the temperature and force of the wind a Buff® or a scarf might be enough. Face masks or a Buff® have the advantage that both the skin is protected and the air you breathe is humidified and warmed. These are invaluable benefits at higher altitudes. In addition to protection from the cold you are also protected from solar radiation and therefore from sunburn. You should be able to combine these different hats, masks and scarves without any pressure points forming. Pressure points can restrict blood-flow and can lead to frostbite.

Gloves

The layering system with gloves requires particular attention and must be planned and checked in advance by the client. Sizes and mutual compatibility are important. You should be able to work in the gloves without them restricting blood-flow in any way. A thin pair of gloves (contact gloves) is the first layer – you can even use thin cross country gloves with hard-wearing hand palms. Over that you should have a pair of waterproof and warm gloves which should be very sturdy. On expeditions you should also take a pair of down mittens and a pair of compatible thin under gloves - this will guarantee you maximum warmth. You should take at least two pairs of spare gloves (windproof mittens) because frostbitten fingers are a very common injury.

Socks & Shoes

Alongside the fingers, the toes are also commonly affected by frostbite on expeditions. A good system for socks and shoes is important on treks as well



because blisters can lead to very serious problems. The basic rule is: no experiments on the journey. Do not use new socks or shoes! In principle woollen socks (merino-synthetic mix) have been proven highly comfortable, warm and they do not start to smell. The socks can be longer than usual (over the calves). When trekking you should only wear one pair of socks. A proper fit is important because wrinkles can cause light pressure and friction spots can occur. 3-4 pairs of these socks should be enough - you can always wash them by hand during the trek.

Footwear must meet the specific demands of the trek. They should not be too heavy or bulky because this will be at the expense of endurance and coordination. Correct fit and good maintenance (especially for leather boots) must be ensured. A good sole, well cushioned with effective grip and protection are the four important points that distinguish a quality mountain boot. For easier parts of the trek/expedition and for use in the cities you can also have a low trekking shoe or even a stable sandal. This has the advantage that you do not have to wear the same shoes every day. On expeditions boot choice is exceptionally important. Many clients fail to achieve their goal due to 'cold feet' and the possible consequences. At high altitudes or at lower temperatures you should apply the layer principle again. This means that you use several pairs of socks and that the boot is also made from multiple layers or has a thermal gaiter. To make the layering principle work the boot has to be large enough. Note: every pressure point on the foot means a point less well supplied with blood and therefore a point more susceptible to frostbite!

A very warm system, the so-called vapour-barrier system exists. During movement sweat is generated which mostly (despite membranes) does not leave the boot. As a result the sock and boot become damp, and insulation is reduced by the formation of what we call a 'cold bridge'. To counteract this loss of insulation American climbers have developed a method called the "Vapour Barrier System". This has been applied worldwide. At low outside temperatures a vapour barrier is installed between the shoe and the foot. This "vapour barrier" consists of a 25-30 litre rubbish bag (or a separate vapour-barrier-socking) that is worn on the foot over a thin synthetic sock. Over this system one or two woollen socks are worn depending on the severity of the conditions. Important note: two pairs of socks can give less warmth than one; if the second pair restricts the blood flow (the toes should always be able to move freely).



The purpose of this "vapour barrier" is to prevent the insulation layer from becoming damp from sweat. It also keeps the feet slightly warmer as the evaporation of sweat is prevented (evaporation cooling). At temperatures below freezing the risk of frostbite with this system is dramatically reduced.

Expedition climbers must buy specifically designed expedition boots that have a layer of thick insulating (and/or integrated neoprene gaiters). These boots also have a very thick sole ensuring that the heat loss to the surface remains low. To improve the insulation further many expedition climbers fit a piece of closed-cell foam insulating mattress between the crampons and the boots.

Clients who do not want to buy their own expedition shoes can also use a lined gaiter with their normal crampon compatible boots.

NOTE:

Even the best clothing cannot guarantee you getting to the summit, but poor equipment will prevent even the best climber from reaching their goal.

The gaiter encloses and insulates the whole boot - it can also be stuck with super glue to the rim of the boot.

Other essential items for Expeditions are bivouac shoes/socks. These are thickly insulated (filled with synthetic fibre or down) and are worn in the sleeping bag to protect the very sensitive toes. They can also be used to make a few steps in around camp (provided there is no danger of sliding somewhere dangerous!) so you do not always have to wear heavy expedition boots.



1.5.3 Transport

On mountain treks/ expeditions big kit bags or duffles (90-140l) prove very useful. Duffle bags that can be unzipped to access their contents without unpacking everything have a big advantage over kit bags which must be completely unpacked to access items at the bottom. The bags should be waterproof and sturdy. Ideally they should have a simple carrying system and be lockable (don't forget a padlock, but remember to leave the bag open for intercontinental flights!). Often the best bags are also quite heavy which is a disadvantage in itself.

A good rucksack is also essential. Gone are the days when you were allowed on-board a plane with a large backpack as hand luggage. Nowadays a small backpack (15 litres) is often taken as hand luggage. This small rucksack can be very handy during city strolls and can also serve as a depot for the stuff you want to leave in the hotel. Alternatively the group could take one or two closable kit bags with name tags to use in the hotel as a depot for the common baggage.

For Treks a 25-30 litre backpack is normally ideal. It should be equipped with a comfortable and effective carrying/back system which is correctly fitted.

NOTE:

New backpacks, like new shoes, have to be tested and worn, so that they do not give you any painful surprises!

A rain cover, depending on the climate anticipated is often a very good idea.

For expeditions a larger model (60-80 litres) is often required. It should be as light as possible whilst still fitting correctly and comfortably.

Advice: The rucksack should be tested at home with a heavy load so that the shoulder straps and waist belt can be adjusted correctly and you know it works well for you before you leave for your journey.

Guides should mention to clients to bring reusable dry sacks in order to protect/waterproof clothes in the duffle or rucksacks, or for water transportation. Dark coloured dry sacks can be used to melt snow or ice along the trek. Plastic bags should be kept to a minimum.



1.5.4 Travel Accessories

In order to make an overseas Trek/Expedition happen a great deal of administrative documentation is required. (Airplane tickets, train tickets, passport and photocopy, Insurance details, vaccination record, In-country permits and visas, credit cards, cash etc.) Some of these important documents can be kept safe by the organising agency by arrangement after arrival in the destination country. During travel to/from and within your destination country you may need up to 5-10 copies of certain documentation with you. These are to hand out at checkpoints, lodging, border crossing points and so forth and often prove very helpful. In the case of emergencies several passport photographs are a very good idea. In terms of cash it is usually advisable to have Euros or U.S. Dollars. To transport valuables on the body clients could consider a "money belt". It is a good policy not to keep all money in one place. Small amounts of money for everyday use are best kept easily accessible in a zipped inside pocket so that large amounts of money are never made visible to strangers.

Almost everyone who makes a trip like this wants to take pictures or video. It is important to have a camera case that is water resistant and keeps the camera as dust free as possible. Ensure enough memory cards are taken and a method of maintaining a power supply. Clients who wish to listen to music, use a radio, a GPS device, or operate a computer should travel with a universal adapter for wall sockets and perhaps a solar panel. These days there are a number of sophisticated systems which offer high reliability and ease of use.

During every trek/expedition there is often a lot of spare time for reading or to play games. Therefore it is advisable to take simple travel games with you and to encourage a book-share within the group. Playing cards or board games are ideal to pass the time. Think about juggling balls, a dartboard, a Frisbee or a ball (beware of the risk of injury) as they are often great for group dynamics and very popular. These things can be brought into the country you travel to and be given away when you leave.

To plan a trip properly you need accurate guidebooks and if possible good topographic maps.



An altimeter watch with an alarm is almost indispensable. It not only helps to divide the daily stages better but also to gain necessary information for acclimatization. A watch with a heart rate monitor function can also be very useful. *Note: The watch should have a light on it and have new batteries prior to the trip.*

A waterproof pen and diary, including the planned acclimatization schedule, should be taken to help document the acclimatization process. At home in the weeks before departure you can start to measure the heart rate at rest. 3-5 days before departure you can check it daily. For those who have one, a pulse oximeter can be taken to measure oxygen saturation (eg, Nonin Onyx® II 9550). This is only useful if you are able to collect precise data and have the knowledge necessary to interpret it.

A pocket-knife or a multi-function tool is always useful to have on the trek/expedition, but be careful not to pack this in your hand luggage on the plane! It can be used to cut food, to effect small repairs and a wide range of other applications. A small repair kit with such things as; needle and thread, safety pins, tie raps/zip ties, super glue, dental floss (very strong thread to sew with), Duct tape, a coil of strong steel wire, amongst other things is very useful. Special items to effect repairs to insulation matts, clothing, tents and cooking stoves should be taken.

For daily hygiene a washing bag with all essential items should be taken but adapted for travel purposes. A small mirror, a wash cloth, two small microfiber towels, toilet paper/ paper napkins (in waterproof bag), toothbrush, toothpaste, nail clippers and tweezers etc. A gel based hand disinfection (Sterillium® Virugard) is an excellent idea and can be used to sterilise hands before dinner. A tub can be given to kitchen staff as well. It is useful to take some biodegradable soap that can be used to wash both yourself and your clothing during the journey.

Note: most wet wipes and microfiber towels are made of plastics and should be avoided, if essential choose plant based wet wipes such as viscose that can degrade naturally.



Although not standard equipment, ear plugs are exceptionally useful for an undisturbed nights' sleep. They work in all noisy environments such as a violent wind or snoring tent partner.

A small but complete first aid kit belongs in every backpack - not only whilst trekking! In addition to the usual bandages a small but comprehensive range of medications should be taken. The following list can serve as a guide - but you should seek advice from your own physician concerning your choice for the exact composition:

Emergency drugs minimal equipment:

- Brufen ® - headache pills
- Cipro ® - antibiotic for severe diarrhoea
- Imodium ® - severe diarrhoea
- Adalat ® retard - high altitude pulmonary oedema
- Fortecortin ® (4mg) + 1 Fortecortin ® - pre-filled syringe (40ml) - high altitude cerebral oedema
- Valoron ® or Tramal ® - severe pain

In addition, you should take the standard drugs for eye and ear infections, stomach and intestinal problems and coughs and colds. Throat pastels which can be sucked are very useful and should be taken in great amounts and different flavours. The normal bandage packs should be supplemented by a second roll of tape, Steri-Strips (for deeper cuts), sufficient wound disinfectant, a cream or ointment to promote healing and a comprehensive blister treatment kit. To protect the medical supplies they should be in a robust waterproof container. *Note: always carry the medical supplies with you!*

Clients should always have a water bottle (about 1ltr) on them to facilitate good rehydration. Ensuring that clients stay hydrated on treks/expeditions is vital to help them achieve their potential. If the water quality is questionable then sterilisation tablets such as Micropur ® or a small water filter/purifier (such as Katadyn or MSR ®) can be used. In addition to a water bottle a thermos flask can also be very useful.



Hot drinks at altitude are very important. The volume of the flask should be at least $\frac{3}{4}$ litres. It should be light, unbreakable and well insulated. Good thermos flasks are often made from stainless steel or even titanium. Camel bags with insulated drinking tubes are loyal companions for many clients and do encourage good hydration, although they have their limitations (freezing, dirty, etc).

A small travel umbrella can be very handy on many tours although it is not essential. During very humid but wet weather a jacket with a membrane cannot transport all vapour from body sweat away from the body and condensation occurs. An umbrella helps to keep the outer layer from becoming saturated and allows more body-vapour to escape. Hence keeping you more dry and giving you more joy of moving. In strong sunshine or high temperatures an umbrella can afford valuable shade from the sun.

Sun protection

The majority of clients are aware of some of the effects of solar radiation although they are often underestimated. Sunscreen only works well when sensibly combined and coordinated with other protective measures. There are two separate areas to be considered.

The first is protective clothing and equipment. A sun hat (with wide brim) or a baseball cap with neck protection is important. Clothing can be "UV-proof", long sleeves and long trousers are important and light reflective colours. Sun glasses should be chosen of very high and robust quality and it is a good idea to have a spare set. On expeditions good ski goggles with excellent glass (or changeable glasses for alternating bright and dark conditions) are a must. Both sunglasses and goggles must offer 100% UV protection and the sides should be closed. They should be category 4 lenses which are the glasses for glacier travel and the brightest conditions. A head strap to fix the glasses is often very helpful. If you plan to wear a helmet, ensure that the goggles and sunglasses are compatible with the chosen helmet. An optional nose protector can be an advantage. People who wear glasses should get sunglasses with optical glass because contact lenses at altitude and on the journey have been proven to be problematic.

Secondly there is chemical UV protection. To choose sunscreen, it is best to seek advice from a good store and select a product appropriate to skin type. The protection factor should be at least higher than 30SPF or better still above 40SPF.



Remember that chemical sun protection deteriorates over time. Be sure to also think about the lips because they require special protection and are used a great deal.

1.5.5 Sleeping Bag & Accessories

One of the most important pieces of equipment for mountain travel is the sleeping bag. It provides us with warmth and restorative sleep for many hours. If the sleeping

NOTE:

The many small accessories may sometimes seem exaggerated but they make the journey much more enjoyable!

bag is too cold or damp the body is unable to recover fully from the efforts of the day and the night will become a torture. Depending on its intended use, you should choose a sleeping bag that will be warm enough in poor conditions (low temperatures) to ensure a pleasant night. The temperature data from the sleeping bags that have met the EU-standard 13537 will guide you. Each sleeping bag has a comfort range, a comfort limit and an extreme range. The level of discomfort experienced by use of a sleeping bag in its 'comfort limit' range will vary according to the individual, but use in its 'extreme' range can easily result in bodily injury. A good trekking sleeping bag is often known as 3-season sleeping bag and has a heat range of about -3°C/-10°C/-29°C (Comfort/Comfort Limit/Extreme). Expedition sleeping bags have a range of about -20°C/-30°C/-55°C (Comfort/Comfort limit/Extreme). The main choice is between sleeping bags with down or synthetic filling. Down has a higher heat output, but only when it is goose down at a mix ratio of about 90/10 to 95/5 (down / feather). Synthetic filling is advantageous in humid environments because these sleeping bags retain a good thermal performance even when they are wet and they also dry more quickly. The cut and the outside material (eg Gore Dry Loft®, Pertex®) are also important. The fit, the moisture transportation and heat output are all directly related to each other.

On an Expedition you should have at least two sleeping bags. One always left at the base camp and the warmer sleeping bag will be used in the high camps. To transport bulky sleeping bags compression sacks are recommended and allow the sleeping bag to be packed small and then waterproofed.

It is highly recommended to take a thin silk sleeping bag liner on Treks/Expeditions which can also be used inside the normal sleeping bag. This increases the heat



output of the sleeping bag and allows it to be kept “clean” for longer as the liner can be washed and dried separately more easily. High quality sleeping bags should not be washed very often, but because hygiene conditions are difficult on treks/expedition the use of a thin liner can increase the lifespan of the sleeping bag. At overnight stays in shelters or hostels in many parts of the world they also prove very useful.

A common problem when you stay at high altitudes is cold feet inside the sleeping bag. Because of the low oxygen partial pressure there is a narrowing of the vessels in the periphery. High altitude mountaineers use a hot-water bottle as a solution to this problem. A half litre water bottle made from aluminium or plastic is ideal for this purpose. It can be filled before bedtime with a hot beverage (tea) and then placed at the end of the sleeping bag. In the beginning of the night you can warm your feet up and later on you have something warm to drink nearby. It is also a good idea to take a "pee bottle" which enables clients to pee without leaving their tent. This saves many an uncomfortable night-time journey, definitely at low temperatures and possibly during a storm.

Sleeping Mats

At least as important as a good sleeping bag is a good sleeping mat. On a trek comfort is often the most important factor (soft, supportive base eg Thermarest Trail Pro ® with 5 cm thickness). On expeditions preventing heat-loss is most important. The base of the sleeping bag is compressed by the body-weight and as a result it does not insulate well here. Two kinds of mats are used to insulate; closed-cell foam in a honeycomb construction (eg Z-Rest ®) with possible addition of clothing under the mattress or by modern high-end inflatable mattresses which are filled with goose down (eg EXPED DownMat9 ®).

1.5.6 GPS and orientation

Topographical maps, an altimeter and a compass are essential equipment for accurate navigation. Many regions of the world are not covered by good maps. A GPS (Global Positioning System) can be very important in non-alpine areas. What GPS to take depends on its intended use. Simple, small and light devices (eg Garmin



eTrex ® 30) with low power consumption have proven better than complicated devices with many functions and big colour displays. If no digital maps are available for an area then this facility is redundant. Only emergency navigation in poor visibility is of central importance. An integrated barometric altimeter improves the performance of the GPS and is therefore recommended.

Providing the necessary energy is also an issue that should not be underestimated as a GPS can only provide security if it works. Alkaline or lithium batteries are recommended. Rechargeable battery packs do work on expeditions but have a lower output than normal batteries. It is important to remember that in poor visibility you should never simply continue just because you have a GPS. An altimeter is often of more use than a GPS and every member of the team should have one for navigation purposes.

1.5.7 Lighting and Lamps

A small headlamp is standard personal equipment for a client on a journey. Small, powerful LED lamps provide a good compromise between a long burn time (low battery demand) and a good level of brightness. For expeditions it can sometimes be useful to have a headlight that can illuminate up to 100 meters or more. For the base camp or in a tent there are small solar-powered lamps that scatter pleasant light and which can be hung up in the tent. With all lamps you must also have enough extra batteries in the right sizes or a solar power source, bearing in mind clients should bring back all batteries to their home country for proper disposal

1.5.8 Cooking

Normally on a trek/expedition you have kitchen staff to prepare food for you whilst in camp or during stays in lodges and hostels. On individual tours or high camps on an expedition you may have to be self-sufficient. This requires a lightweight and functional stove.

With cooking systems you can choose between gas and liquid fuel. A gas stove has the advantage that it is easier to use, more secure and less prone to malfunction. The disadvantage of gas is that it is not always possible to obtain in the desired amount and quality (propane, isobutene and butane). It is not possible to transport this in normal hold luggage on commercial flights (except on cargo flights).



The correct mixture of gases is very important. Pure butane gas does not work properly in cold weather. In addition not all gas canisters are universally compatible. For journeys to regions without a secure source of gas canisters a liquid fuel stove is recommended. Clients should be aware that specialized or uncommon gas containers are unlikely to be recycled, and locally available fuel sources including plant based ethanol should be prioritised.

A number of burners are able to "burn" any fuel which means that should reduce concerns about fuel resupply. Despite this you should always strive to use the highest quality fuel available in order to ensure that maintenance does not become a problem. It is important that the stove and the pots perfectly fit each other. Ideally use a complete cooking system from one brand (eg Jetboil ® or MSR Reactor ®). These types of system have the advantage that the pots cannot fall over easily. They have other good features such as an integrated energy-saving heat exchanger, reducing sensitivity to the wind and ensuring efficient fuel consumption. Pots are best made of titanium (for example snow Peak ®) because they are light-weight and have a high heat transportation factor. *Important: do not forget to take extra lighters or storm matches, since the built-in piezo igniter often does not work at higher altitude.*

NOTE:
Cooking has to be learned! Especially for amateurs house cooks.

In high camps your basic personal eating equipment should be a bowl, a spoon and a thermal cup because you often eat dehydrated food. Ideally everything should be made of unbreakable plastic. In addition you have your thermos bottle/flask which we have already discussed.

Food normally consists of special dry products that only have to have hot water added to them before eating. This form of food soon becomes monotonous so it is advisable to take packet soups, stock cubes and sauces in different flavours to supplement the taste. A good supply of liquids should be a high priority. Small treats/snacks are not only nice to have in the high camps but also pleasant on long treks. They can have a very positive effect on your well-being and morale, and can often still be eaten even when your appetite is affected. It is important to try to take in



account individual preferences of all participants into consideration when selecting food for the trek/expedition.

1.5.9 Tents

The tent should be selected with careful thought about its intended use. Treks often rate space and comfort as the most important factors whilst expeditions favour low weight and high strength in order to withstand difficult mountain conditions. There is a large selection of high quality products available. It is wise not to be too frugal because the success or failure of an endeavour often depends on a good tent. Nowadays all the leading tour operators often have excellent material depots in country so therefore it is not usually necessary to bring your own tent.

1.5.10 Emergency Equipment

The emergency equipment is especially important with mountain travel in foreign countries. Unlike in the Alps there are no formal mountain rescue services available and you often have to help yourself. This self-help can only succeed if you have complete and fully functional emergency equipment. In addition to a first-aid kit complete with emergency drugs and communication equipment the following items can prove very useful and potentially lifesaving:

Two-person bivouac bag made from lightweight, windproof and waterproof material.

Avalanche transceivers, shovel and probe with trek/expeditions that have avalanche danger.

Oxygen (Wenoll ® system) and / or an pressure bag/ Gamow bag (eg Certec bag ®) for any height-related problem.

1.5.11 Ski pole and ice axe

On demanding treks and especially on more challenging expeditions to extreme altitudes efficient upward movement is crucial. The greater the economy of effort the less energy and oxygen is consumed allowing more to be held in reserve. This efficiency of movement enables ascents to 8000m or higher. Movement should be slow and considered. The foot should be placed uphill and the weight eased



smoothly onto it in a steady and controlled fashion without any undue strain or effort. To enable this, the axe should not be too short where it cannot be lent on for support. As a guide, when standing in an upright position with the hand holding the axe stretched, the floor should just be reached (60 - 70cm). A slightly longer axe also has the advantage that it can make a more effective belay (T-Axe anchor). When the route is more technically demanding you should ensure that you have a climbing axe and not an "ultra-light" axe. Although they can be very light they are not very effective for real climbing purposes.

Cold fingers when using an ice axe can be reduced by insulating the head of the axe. This can be done by wrapping the head of the axe in foam (insulation tube) and tape. Disadvantage: it is harder to hold on to the axe.

The ski pole should not be too long as this can result in a reduced blood flow to that hand and encourage cold fingers. By the supporting use of the ice axe and ski pole the shoulder muscles are stabilized, which has a positive effect on the respiration (supporting the respiratory muscles). Light telescope poles with insulated grip and reliable adjustments have proven to be very effective in treks and expeditions. They also have the advantage that they can easily be stowed away for the journey



Other technical equipment

<input type="checkbox"/> Harness	Very lightweight, fully adjustable and easily to put on; unpadded expedition- or race models have a big advantage over heavier sport climbing harnesses.
<input type="checkbox"/> Helmet	Hardshell- Foam-combination helmet, tested with balaclava, selected for appropriate use.
<input type="checkbox"/> Ice Axes	Depending on climbing grade, different models that can also be used as an anchor (strong shaft with a sharp pick)
<input type="checkbox"/> Crampons	Depending on the use: steel crampons with lever-lock fixation and anti-balling plates or light crampons with strap bindings. Important: adjusting of the crampons must be done at home!
<input type="checkbox"/> Ice Screw	Steel or titanium, at least 18 cm long with a good cover, amount depending on the objective.
<input type="checkbox"/> HMS Karabiner, locking karabiner and normal karabiner	Small, lightweight design in sufficient numbers.
<input type="checkbox"/> Belay- and abseiling device	Belay device with plaquette function.
<input type="checkbox"/> 1 or 2 ascenders	With a large handle (operation must be possible in mittens)
<input type="checkbox"/> Slings	120 cm, 240 cm, 300 cm, stitched and open ones.
<input type="checkbox"/> Different cords	Different lengths, matching diameter, open.
<input type="checkbox"/> Climbing ropes	For difficult passages in rock and ice
<input type="checkbox"/> Static ropes	For the parts that are to be fixed.
<input type="checkbox"/> Dead man / Snow anchors	Possibly acquire locally?
<input type="checkbox"/> Marking material	Marking tape for poles etc.



1.6 Communication & Power

A powerful communication system is useful on treks and indispensable on expeditions. In principle there is a distinction between communications internal to the trek/expedition often made with radios and external links often made with satellite phones.

1.6.1 Radios and satellite phones

In terms of radios people usually go for cheap ones that do not require approval or licences. PMR devices (Private Mobile Radio) with 5 watts output power (about 5 km range). Those who possess them could use a 2-meter band VHF device (144-148mhz) but these often require a licence and can be difficult to import or not officially approved of in many countries. On mountains where there are multiple expeditions it makes sense to use the 2-meter band devices and ensure that they are compatible with other teams on the mountain. This would allow backup to any PMR used and help facilitate good cross-team communication in the event of any potential rescue operation.

A satellite phone is standard nowadays in guided groups. There are several systems available. The cheaper Thuraya® system does not work across the whole world (only in Europe, North Africa, the Middle East and Central Asia). The Iridium® system is more expensive (also the operating costs) but works worldwide. Inreach® systems and other technologies become more common. For data transfer you can use the Inmarsat® - System.

1.6.2 Solar Energy

Because you cannot carry unlimited numbers of batteries on your journey it is a good idea to consider the use of solar power. Small and powerful solar panels with backup batteries and universal chargers are ideally suited to charge cameras, mp3 players, light sources, radios and telephones. If you use appropriately sized panels and good backup batteries you can even use your laptop and produce a normal 220 V current. It is essential to test everything at home prior to the trek or expedition and that you have all the correct adapters available.



2. Travel to Base Camp

2.1 Logistics & Cargo

The equipment required for a Trek or Expedition these days is not on the same scale as it once was for the great expeditions towards the middle of last century.

Nevertheless, even in the modern "light" style of a commercial tour there is plenty of equipment which must be packaged and transported. This requires advanced planning and investigation into methods of transportation and customs clearance procedures.

Big tour operators usually have an equipment warehouse in the countries where they operate. This is often managed in cooperation with their local agents. For journeys to unique or unusually exotic destinations all the team equipment together with the clients' personal gear must be brought safely and cost effectively from the point of departure to the destination. With airlines excess baggage allowances becoming more stringent and expensive, sending the baggage in advance as Cargo (air or sea) should be considered. The Freight Company or local partner agency may be able to clear the baggage through the customs of the destination country before the group arrives. Alternatively the Leader or advance party can fly in a couple of days in advance of the main body to settle customs formalities. This ensures that the whole group has their entire luggage from the moment that they arrive in the destination country. This is the best way to prevent any transport errors and eliminate problems caused by equipment losses or delays. At the same time it is worth planning how you are going to get all equipment and baggage back to the point of departure and what you plan to do with certain consumable goods (Expedition food, Gas canisters, unused batteries etc.)

2.2 Entry Visas & Permits

Entry into many countries is subject to Passport and Visa requirements. Clients should be notified clearly, well in advance of the trek/expedition departure as to the specific Visa requirements. Clients should be informed if they are expected to obtain the Visa or if the tour operator will do this for them. If this is to be done by the individual the method of obtaining the Visa and the timeframe required should be



highlighted. Trek/Expedition groups often draw together clients of different nationalities and all applicable national entry requirements should be included. Clients should be advised to carry several photocopies of their Passport and Visa documentation and additional passport sized photographs with them, just in case.

Responsibility for obtaining the trek/expedition permit falls to the tour operator/mountain guide. The permit often needs to be collected in person at the issuing office in the destination country. Ideally this should be done prior to the arrival of the group. This allows time to sort out potential difficulties and helps to avoid unforeseen delays. If this is not possible then the group can be entertained with sightseeing activities whilst the leader obtains the permit. This can often involve many hours spent sitting in ministries, etc.

A robust water-proof document folder should be standard equipment for mountain guides whilst leading overseas treks/expeditions which involve considerable organisational paperwork. The itinerary and contingency plans, plane tickets, visas, passport copies, insurance documents, permits, medical information etc. should all be found in this central folder. It is also useful have detailed lists with all the relevant information concerning the clients (Several copies of the group name list, allocated room numbers in hotels etc.) This not only makes administrative procedures and controls at check points simpler and easier but it also assists with checking in at hotels.



3. During the trek/expedition

3.1 Organisation and Logistics

Once all of the initial preparation has been completed it will be possible to commence the tour. Customs and immigration will have been cleared, all permissions and permits will have been obtained, the baggage will have been prepared and packed in water and dustproof barrels or kit bags and the whole group will hopefully be healthy and fit for the first stage of their journey.

The leader/mountain guide has the task of manager and agent. They must look after the porters, the kitchen staff as well as the clients whilst they live and journey together over the coming days and weeks. This requires a degree of authority, together with empathy, an understanding of the culture and experience of managing people. The purely technical mountaineering tasks on a trek/expedition are only a small part of many trips. They are generally more straightforward and easier compared to the daily task of managing logistics and the group dynamics.

A high priority in addition to the organisational tasks is maintaining the health and physical performance of the entire team. The use of some simple resources (see subsequent chapters) can help avoid many pitfalls and potentially damaging errors. This includes also a straightforward communication regarding procedures in case of illness, accidents etc. of one or more members of the team (return of the whole team, preference of assistance and help to others, etc.)

Clear instructions and procedures will help everybody pack their luggage correctly each morning and ensure that each load is given to the right porter. This should happen whilst the clients have breakfast and prepare for the coming day.

NOTE: Set clear procedures for and give good daily briefings to your clients and trek/expedition staff .

To do this properly the leader/ mountain guide must know the procedures of their staff and the details of each stage. This should be prepared and confirmed in advance of each day and briefed to the clients the night before. Good communication with the in-country staff is very important. Over tea in the kitchen tent is a good time



to talk to the staff about the important issues for the next day. It is also a good time to check the condition of the crew and monitor the hygiene in the Kitchen.

Before any difficult stages the leader/ mountain guide must ensure that the entire team has been given appropriate equipment to the conditions and that they use it. This is so that the whole group travels through dangerous passages as safely as possible. If there are any fixed ropes that must be set up on the track they should be organized by an advanced party that may have to be semi-autonomous. The advanced party should be given a good, clear briefing as to what they are to install and what is required of them after the installation.

If the Expedition plans to use high altitude porters then they must be selected in advance and their fitness should be checked. Nowadays in many foreign countries there are excellent climbers who offer their services as high altitude porters. Some of them have leadership qualities and are able to look after clients on the mountain. Many have a good level of skill but they cannot be used as supplementary leaders. It is the responsibility of the leader/mountain guide to hire the appropriate staff and to ensure that they are equipped properly according to the nature of the trek/expedition. Local rules should be acknowledged and IFMGA colleagues employed wherever possible (See IFMGA Guidelines in the Appendix)



3.2 Tactics - 10 Basic Rules

"Discover the mountains of the world! Dive with fascination into nature, into foreign cultures and religions and enjoy the warm hospitality of mountain people in East Africa, Nepal, Tibet, China, India and South America! Be inspired and expand your horizons together with similarly minded people. Remove yourself from the stress and strain of modern life. Remind yourself about the important things in life and follow your dreams..!"

It is with words like these that we as mountain guides try to sell adventure travel to our clients, enticing them to travel to some of the beautiful and fragile mountain regions around the world. It is not surprising therefore that the number of travellers to the high mountains is continually rising and they are no longer all experienced mountaineers. A mountain guide leading such relatively inexperienced clients must have knowledge of the most important principles of high altitude mountaineering. Problems can quickly turn any dream tour into a nightmare, particularly health problems.

3.2.1 Physical Requirements

As a result of increasing altitude, the air pressure, relative humidity and temperature all drop and levels of UV radiation rise. This places increased strain on the human body compared to similar physical endeavours at home. Alongside this clients have to cope with different climatic conditions, the change in time-zone, alterations to sleep patterns, a change in diet and different conditions of hygiene. Adapting to all this requires clients to be in good physical condition even if the sheer physical burden of the tour/trek is relatively small. It is highly recommended for all clients to have a health check with their physician before embarking on a trek/expedition. A tour operator/ leader would be wise to oblige their clients to undergo such a health check as part of their risk management procedure.

3.2.2 Acclimatisation

Up to an altitude of approximately 5500 meters complete acclimatisation is possible for healthy travellers so long as you give the body sufficient time to adapt to the changed environmental conditions. The body responds to the increased altitude and



reduced oxygen supply immediately by increasing the respiratory drive and heart rate. The heart rate is an important indicator of adjustment to altitude. Over longer periods at altitude there is also an increased production of red blood cells and improvements in oxygen utilisation within the cells.

The principles presented below are originally from Germany Sports scientist and expedition leader *Thomas Lämmle*. In 2012 he wrote the book "Höhe x Bergsteigen" (Altitude x Mountaineering), published by the DAV Summit Club, which is recommended reading for anyone who is interested in further study.

The following of the rules by the clients is one of the tasks of the guide.

1. Do not go too high too fast.

Anybody can get altitude sickness if they ascend to altitude fast enough! The most crucial criteria concerning adaptation to altitude is the speed of ascent. Active climbs on foot are therefore tolerated much better than passive ascents in a car or an aircraft. A general rule for the ascent rate is: "At altitudes above 2.500 meters problems are rarely encountered if you do not increase sleeping altitude more than 500 meters per day." Not everyone adapts to altitude equally well. This makes it very important to have a highly flexible travel plan that allows for "spare days".

These can then be used for extra acclimatisation. In order to do this of course you cannot be under a great deal of time pressure.

2. Pay attention to the altitude you sleep at.

The altitude that you sleep at is crucial for acclimatisation and it is better if it is lower than the maximum height reached that day. High camps above 5,000 meters should not be slept at before you have reached a similar altitude (or ideally higher) twice before on the trek/expedition. Some experts recommend that after arrival at your camp and taking a small rest, people should climb slowly for additional 30 minutes or so without luggage. This in order allows the body to exceed the sleeping altitude without placing excessive strain on it. Although this has not been medically proven it does allow you to monitor the groups' acclimatisation because clients who have enough energy and the desire to go higher must be feeling quite well.



3. Watch your heart rate and take your time.

The Heart Rate at Rest (taken lying down, after waking up – HRR) is a parameter that supplies reliably information about the personal level of acclimatisation. If the heart rate is elevated by more than 20 per cent compared to the heart rate at rest at home, it indicates a critical phase of acclimatisation. Whilst in this phase it is very important to not over strain the body. This brings us to the next important principle; "Go slowly and do not wear a heavy rucksack!" A correct Heart Rate under Load (HRL) whilst trekking should not exceed 75 per cent of an individuals' maximum heart rate. A rough calculation can be made of correct HRL with the formula: $HRL = 0.75 \times (220 \text{ minus age of individual})$. For a more accurate value a sports medical examination or an exercise ECG is required. Should the HRR on the trek/expedition be more than 20 per cent higher than HRR at home then at least one rest day must be taken – or even descend a little. The use of a pulse oximeter is recommended.

4. Observe your clients.

Altitude-related problems are very often ignored or deliberately concealed. One of most important rules for mountain guides is therefore: "Observe your clients and speak to them about your concerns if you suspect acute mountain sickness". Warning signs for altitude sickness include; sudden loss of energy, a strong and persistent headache, loss of balance, breathing difficulties, nausea and/or vomiting. These are indications of acute mountain sickness or pulmonary- or cerebral oedema.

5. Descend immediately if you suspect altitude sickness.

At the first signs of acute mountain sickness (AMS) or pulmonary or cerebral oedema immediate descent to lower altitudes is the best treatment. One study has shown that HAPE-patients (High Altitude Pulmonary Oedema) who were treated at altitude were 15 times more at risk of dying than those who were immediately transported to lower elevations. When the situation is unclear or in cases of severe altitude sickness a combination of therapies must be used to gain time until descent is possible. Therapies include the use of Dexamethasone, Nifedipine and Oxygen/Pressure bag/Gamow. A comprehensive understanding of altitude sickness, recognising its symptoms, its treatment, appropriate medication and how to use them correctly is essential for any leader/mountain guide working at high altitude. Clients



rely on their leader/ mountain guide for their experience and knowledge in this area and therefore a thorough preparation is particularly important.

6. Watch your health. (This applies to both mountain guides and their clients)

One of the biggest challenges on an expedition is to reach the base camp in a healthy condition. The risk of infection during stays at altitude is higher. It is only possible to protect against diarrhoea with strict hygienic standards. Washing hands before food preparation and consumption is essential. The rule: "cook it, peel it, wash it or forget it!" should be firmly maintained. Respiratory problems resulting from the dry and often dusty air can be avoided by keeping the mucous membranes moist by the use of a cloth in front of the mouth and by sucking pastilles/sweets.

The health of the leader/mountain guide is particularly important because if they become ill the success of the entire undertaking is at risk. In addition they must set a good example and not presume or strive to show that they are invulnerable.

7. Drink a lot.

The increased breathing rate at altitude, combined with the colder, drier air results in increased fluid loss from the body. At high altitude this can reach 3.5 l daily. This amount must be replaced through food and drink each day otherwise the risk of dehydration and the associated drop in physical performance increases. Dehydration also increases the risk of thrombosis/embolism and frostbite. Because the sensation of thirst is encountered only once the body is already dehydrated and cannot cover the increased demand for liquid clients should be encouraged to drink at every opportunity. So-called water bags (eg Camelbak®) combined with a flexible drinking tube are very useful for facilitating regular drinking. The leader/mountain guide must ensure that there is always enough to drink for the clients.

8. Only stay briefly at extreme altitudes.

The magic number in high-altitude mountaineering is 5,500 meters (this is the acclimatisation limit). Above this altitude of approximately 5,500 meters humans cannot acclimatise totally or live permanently. At altitudes above this limit there is a steady decline in performance. It is clear that you can continue to acclimatise to 8,000m in the sense that it is easier the next time you go to that altitude. Nevertheless



there is a gradual muscle mass loss and body-weight reduction which eventually results in death through exhaustion. Base camp should always be located below this limit. Above 5 500m the principle "Speed is safety" should be applied. This speed can only be achieved if you are very well acclimatised. For a successful trek/expedition one should therefore leave enough time for the approach and acclimatisation in order to move efficiently, quickly and therefore safely after that.

9. Sleep well.

Clients on Trek/Expeditions often have difficulties sleeping well at altitude. With increasing altitude the length of sleep shortens and the number of disruptions to sleep increase. Good sleep is very important to enable the body and mind to recovery. If unusual sleep disorders occur they should first be considered a sign of acute mountain sickness (AMS). High altitude pulmonary oedema (HAPE) usually manifests first during sleep. It is considered that an irritation of the respiratory centre is responsible for triggering this disorder. Increasing sleeping altitude by a maximum of 600meters, providing adequate ventilation inside the tent, sleeping with the upper body slightly elevated upper body and not taking sleeping pills will help prevent its occurrence.

10. Plan your stay at altitude.

Only about 50 per cent of all expeditions are successful and numerous treks are forced to end sooner than expected. The main reason for this poor success rate is often inadequate planning of the journey. Four errors are made repeatedly, these are:

Duration: Make sure you allow enough time to achieve your program! Although modern jobs do not always allow large amounts of holiday to be taken at once a mountain journeys should never take place under time pressure. We should maximise the use of clients precious holiday time but understand that when small complications lead to "stress", the whole undertaking is doomed to fail.

Travel dates: Research the weather conditions and climate at your destination. Not all seasons are ideal for travel to every country. Even if a special offer is very attractive in the off season or one is afraid of too many other tourists, the goal should



be realistically achievable in the proposed period.

Itinerary: Make sure your schedule takes account of the rules of good acclimatisation. Although travelling from Europe to Kilimanjaro and back in a week is theoretically possible, in practise most clients will fail and turn around suffering from acute mountain sickness or worse!

Group Composition: Get to know the clients in advance and make sure the destination and objective fit to the skills of the group. Do not take a client on a trek/expedition which is clearly beyond their capacities simply because they are paying you. Remember that on treks/expeditions the human factor and group dynamics play a very important role. This can have a positive effect because clients enjoy achieving a common goal with like-minded people. On the other hand if group conflicts develop they can easily spoil an entire trip. If you have met your clients beforehand then you provide an opportunity to discuss any different ideas within the team in a relaxed atmosphere and ideally come to a mutual understanding in advance.

3.2.3 TREX - Health Check

It is not unusual when people travel to a different living environment (such as high altitude) for health complications to occur. It is not inevitable that they lead to serious injuries or even death. The fact that they do so is usually as a result of a combination of factors such as, ignorance of the condition, misjudgement, and excessive ambition and so on. It is rare that pure unchangeable circumstances result in dramatic consequences.

Climbing at high altitudes has been marked by two new developments. Firstly there is an *area-time concentration*, where more and more people travel to a popular destination during the most favourable time- or “high season”. Secondly there is an *area-time extension*, which results in more remote regions being sought after during less usual times (during winter or rainy seasons, the “low season”)

3.2.3.1 Problems

Obviously health-related problems are not as easy to resolve in extreme and remote environments where highly advanced medical care is not as accessible as it is in



Western Europe. Because of this, the maintenance of good general health must be given a higher importance since early interventions can often prevent bigger problems later on. In this context a record of on-going current health status should be a priority.

The TREX Health Check procedure described below has been developed over many years and tested in practice both with commercially lead Treks/Expeditions as well as with private groups. The basis for this system of evaluation comes from the Lake-Louise-Score for acute mountain sickness. Major suggestions are used from the unpublished work of Thomas Lämmle on "Daily medical protocols for expeditions". Based on 22 categories that cover the general state of health, it uses a score to evaluate both the current health (a daily score) as well as the health trend of an individual (comparing several days). A specific classification of the individual problem areas is also possible which allows targeted action to be taken. For example, if you get 3 points in one category you should take "immediate action". In all cases 3 points is a Warning = Alert!. The points printed in bold are considered to be symptoms of acute mountain sickness (AMS), High altitude pulmonary oedema (HAPE) and High altitude cerebral oedema (HACE).

The most straightforward way to record the scores is to copy the list of categories as values into a table with 22 rows. The subsequent columns of the table represent each of the days on the trek/expedition. This affords a very clear comparison from day to day.

3.2.3.2 The points system

The TREX-check system is designed to only give you a score if you are outside what is considered the physiological "normal state". 3 points indicate that appropriate (emergency) measures should be taken. At all times Acute Mountain Sickness (AMS) should be considered as a possible cause of any symptom. This is a sensitive issue in practise because even very experienced people first look to other causes to explain their symptoms, (such as sunstroke, dehydration, something in the water, a chill, etc.).



The psychological component plays an important role in the group and therefore also the interpretation of i.e. pulse and oxygen saturation should be discussed clearly within in the group.





Trex – Check

	Name		Amount
1	Date		
2	Sleeping altitude	At what altitude did I sleep?	
3	Highest daily altitude	How did I go today (maximum)?	
4	Travel time / altimeter	Distance of and time taken for the daily stage.	
5	Resting pulse	In the morning – just after waking up	
6	O ² saturation	Amount, measured with Pulse-oximeter	
7	Pulse – Points	0 ... up to 5 beats over the normal rest pulse 1 ... 6 till 15 beats above normal 2 ... 16 till 30 beats above normal 3 ... > 30 beats above	
8	Sleeping – Points	0 ... normal, usual sleep 1 ... moderate sleeping disorder 2 ... heavy sleeping disorder 3 ... complete insomnia	
9	Breathing – Points	0 ... normal breathing 1 ... slight breathing difficulties 2 ... difficulty getting your breath during exercise 3 ... difficulty breathing at rest (dyspnea)	
10	Headache – Points	0 ... no headache 1 ... slight headache 2 ... moderate headache 3 ... massive headache	
11	Appetite / Nausea – Points	0 ... normal appetite 1 ... loss of appétit or mild nausea 2 ... moderate nausea and/or vomiting 3 ... severe nausea and/or vomiting	
12	Urine – Points	0 ... clear and a copious 1 ... somewhat darker and reduced. 2 ... dark yellow and very little 3 ... hardly any urine and very dark	
13	Stools – Points	0 ... normal (shape able) 1 ... soft 2 ... very soft 3 ... diarrhoea (liquid) 3 ... constipation	
14	Fatigue / Weak Performance ability – Points	0 ... no fatigue – weakness; no performance change 1 ... low fatigue – weakness; some performance change. 2 ... moderate fatigue – weakness; moderate, continuous drop in performance	



		3 ... great fatigue – weakness; strong, sudden loss of performance	
15	Dizziness – Points (Vertigo)	0 ... no dizziness 1 ... mild dizziness 2 ... moderate dizziness 3 ... severe balance problems	
16	Injury – Points	0 ... no injuries 1 ... slight, small injuries 2 ... limiting injuries 3 ... serious injuries	
17	Illness – Points	0 ... no illness 1 ... mild illness 2 ... limiting illnesses 3 ... severe diseases	
18	Feeling – Points (Motivation)	0 ... no problems, good condition 1 ... weak motivation 2 ... severe motivational problems 3 ... bad mood, very little motivation	
19	Daily total:		
20	Fever		
21	Injuries / Illness (short description)		
22	Taken medication (short description)		

1. Date

The date enables a chronological relation of the collected data and creates a time profile. This enables acclimatisation to be planned and allows the evolution of a clients' health to be monitored.

2. Sleeping altitude

The sleeping altitude is important because it indicates the increase in altitude at each stage. This is usually the amount that is written down in the itinerary in acclimatisation profiles. Most early altitude related problems can be managed by either delaying an increase to the sleeping altitude (additional day off on the same height) or with a reduction in the sleeping altitude (descent to a lower camp).

3. Highest daily altitude

This is the highest altitude achieved on that day and it can often be significantly different from the sleeping altitude.



4. Travel time, altimeter

These points provide information about the daily performance and allow a basic assessment of whether the nightly "exhaustion" is caused by health issues or simply because it was a long and arduous stage. It is important information concerning the overall progress of the journey and also about the power level of the group at that particular altitude.

5. Resting pulse

As a result of exposure to altitude there is a complex acute reaction which usually ends with an adaptation (acclimatisation) to a given altitude (up to 5500 m). The increased heart rate at rest (HRR) of an individual is a simple detectable sign that they are in the critical adjustment phase. Acute Mountain Sickness (AMS), High Altitude Pulmonary Oedema (HAPE) and High Altitude Cerebral Oedema (HACE) if they occur will do so in this adaptation phase. In fact almost all health disorders have increased heart rate at rest as a symptom. Which is why the resting heart rate is a very meaningful parameter concerning the general physical condition.

6. O² - saturation

As altitude increases aspiratory oxygen pressure (PIO²) reduces and this results in decreased arterial oxygen pressure (PaO²) and arterial oxygen saturation (SaO²). This puts the body into a hypoxic state which stimulates the respiratory drive and increases the heart rate. A measurement of the arterial oxygen saturation should therefore be highly relevant to an assessment of the general medical condition. In practise the O² saturation should be interpreted with caution. It has been shown that sometimes people with very low oxygen saturation have been able to perform much better than those with significantly higher saturations. Another problem is the difficult of obtaining a true measurement and the ease of manipulating it. Despite this it is a parameter that is of interest if you compare it "day by day".

7. Pulse

The starting point is your resting heart rate (at home). During your journey you measure your heart rate at the same time every day morning whilst you lie quietly in



your sleeping bag or bed. Modern heart rate monitors matched to watches are very useful for this purpose and can be worn even whilst sleeping.

8. Sleep

With any sleeping disorder we must consider acute mountain sickness (AMS) before looking for other explanations. On treks/expeditions the change in sleep circumstances must also be considered. The often cramped conditions inside the tent (claustrophobia), the extreme proximity to your "tent partner," the hard sleeping surface or low temperatures can all lead to sleep disorders. It can be very difficult to share a tent with someone who has a significantly different approach to hygiene than you do, or who snores loudly. In addition to this, frequent visits to the toilet can be disruptive to good sleep. Last but not least there is also the additional mental strain to be taken into account. This is especially important just before difficult and challenging stages can often lead to disturbed sleep. An assessment should be done objectively despite any alleged cause.

9. Breathing

Increased respiration of dry, dusty and cold air can result in the drying out of the mucous membranes of the nose and mouth. This can often cause coughing. In severe cases it could even lead to shortness of breath and a sense of suffocation. With persistent strong coughs it can lead to fatigue fractures of the ribs. Since the airways are very sensitive you should consider breathing through a "loose" cloth placed over the nose and mouth. This warms and moistens the air a little and filters it of coarse dust. Plenty of warm drinks, simple cough candy and if necessary, pastilles help alleviate these complaints.

10. Headache

A headache is one of the most important indicators and the main symptom of acute mountain sickness AMS. Here it is usual that people first consider altitude as a cause and forget to consider other reasons. Nevertheless a headache can result from exposure to strong radiation (sun) or dehydration. Under no circumstances should the headache be ignored. You must never dismiss a headache because it might be the first sign of High altitude cerebral Oedema (HACE) which is very serious.



11. Appetite / Nausea

When travelling in foreign countries with a different diet it is not unusual to experience some problems with eating. However, loss of appetite, nausea and/or vomiting should be considered indicators of possible acute mountain sickness (AMS). In particular when symptoms do not affect the entire group, or when the symptoms reduce or disappear after a descent (from a high camp). However, it is not unusual on treks/expeditions that due to poor hygiene or improper food preparation many sometime serious stomach and intestinal problems occur. With this in mind special attention should be given to the quality and purity of the water.

12. Urine

Good hydration is vital to success on a trek/expedition. Physical performance significantly depends on it. In addition the fluid balance plays a central role in the process of adaptation to altitude and our susceptibility to frostbite. Since thirst cannot totally take account of the actual bodily need for water at altitude it is important that fluid is taken at every opportunity.

13. Stools

One of the most common illnesses whilst travelling in a foreign country or mountaineering at altitude is diarrhoea. Few travellers escape this unpleasant and debilitating experience at some point in their lives. Despite the frequency of occurrence, the potential and very serious consequences of diarrhoea should not be underestimated. Diarrhoea can lead within a very short time to extreme dehydration. A reduction in fluid that is impossible to replace by drinking alone. The effects can be so profound so as to prevent further progress completely. A longer lasting constipation could lead to severe health problems.

14. Fatigue – Weak performance

Fatigue and weakness are key symptoms of acute mountain sickness. A reduction in physical capacity is often a sign of (still) insufficient acclimatisation. After an arduous or difficult stage in the program you should not immediately put the fatigue or exhaustion felt solely down to its completion. Particular caution is advised



when fatigue and weakness occur in combination with other symptoms (nausea, anorexia, insomnia ...) or when it is only one person in the group who is affected.

15. Dizziness (Ataxia)

Dizziness and balance disorders are also typical symptoms of acute mountain sickness. These signs are not only very important indicators of altitude sickness but are by themselves a tremendous hazard. Especially in exposed and steep terrain (danger of falling).

16. Injuries

On treks/expedition people it is not unusual for people to get injuries. These range from overuse injuries to trauma both small and sometimes more serious. A good knowledge of wilderness first aid is essential. For more serious injuries stabilisation and transport down the mountain as rapidly and as gently as possible is often the only possible course of action.

17. Illnesses

This covers all illnesses that are commonly encountered on treks/expeditions. For example, colds often occur as do infections of the throat, mouth, eyes and ears. The top priority should be a rapid and adequate treatment that is started at the first signs.

18. Emotional state and motivation.

This section makes an assessment of the general mood of a client. Lack of motivation, apathy, behavioural changes and mood disorders can often have underlying causes that are very important not to ignore. Anyone undertaking a trek/expedition should know their body well and be able to read signs that might indicate that something is not right.

19. Daily total.

Each day the points are evaluated and written down then added together. The TREX - check should be performed each afternoon or evening. The heart rate at rest should be measured immediately after waking up in the morning and recorded. The sleeping altitude is that of the previous night. The total point score therefore forms a



relative measure for an individual's own health. It is not for comparison within the group. The lower the total value the better the general condition.

0 Points: Exceptional state of health (or cheated a little...?)

1-5 points: Good condition, no need to worry.

6-10 points: WARNING, go on the next stages carefully and monitor your own development closely. In the areas where you have points try to take appropriate "counter-measures". This suggests that you have a mild form of acute mountain sickness (AMS).

11-18 points: ACT! Take a rest day and do not ascend any higher. Take time to allow good treatment of your present problems. This suggests that you have acute mountain sickness (AMS).

19-36 points: ALARM, ACT QUICKLY! Urgent measures must be taken immediately. Descend and/or seek medical treatment. A severe form of acute mountain sickness (AMS) or severe health problems are present.

20. Fever

The seriousness of many illnesses is better assessed if you know whether or not they are accompanied by a fever. If you must decide whether to have a day off or not the presence of a fever is an important decision factor.

21. Injury / illness

In order to document the course of an illness or injury better a short description should be made in this column. In complex injuries or illnesses detail in this description can form a valuable reference for any subsequent (medical) treatment.

22. Taken Medication

This should document the consumption of any medications and can therefore be used to monitor their effectiveness.

3.2.3.3 Concluding remarks

This TREX - check is primarily intended to be used to monitor the health status of a group or an individual in a simple yet comprehensive fashion. So that timely and appropriate action can be taken. In order to be able to make the right decisions concerning this information it is essential that a leader/mountain guide understand and study the central guidelines of high altitude medicine.

The most common conditions (AMS, HAPE, HACE) must not only be identified but they must be treated properly. The TREX - check is an aid that can be used in the first line of defence. A deeper understanding must be learned on dedicated courses or (at least) from the literature. It is rare to have a doctor in the team who is specially trained in high-altitude medicine. Therefore the selection and application of drugs and other treatment must often be decided by the leader/mountain guide.

This can only be possible with great care and with the necessary background knowledge.

A good and trustful relationship within the team helps to realize upcoming problems early and solve them.

It should be recognised that by following certain procedures and applying certain standards on treks/expeditions clients are not prone to major health risks. This means that we can concentrate on the fun and help them get the most enjoyment out of the experience.



3.2.4 High Altitude Illnesses

Prevention of high altitude illness is most important on an expedition. This is best done by having a good acclimatisation programme. Above 3000m an ascent rate of 400m a day (sleeping altitude) with a rest day every third day is a conservative rate of ascent which should help avoid altitude illness. The terrain on the mountain often dictates where camps can be made and this should be factored into the acclimatisation programme.

There are three types of high altitude illness and it is very important to be able to recognise and treat these.

1. Acute Mountain Sickness (AMS)

This is a relative common illness at altitude caused by gaining height too rapidly for the body to adjust to the reduced level of oxygen. Although not life-threatening it can develop into HAPE or HACE so must be taken seriously. AMS usually presents itself within 24hrs of an ascent to a new altitude. Patients with AMS can resume their ascent once symptoms resolve.

Signs and Symptoms of Acute Mountain

Headache – (worse on bending forward, coughing or straining) together with 2 or more of the following:

Loss of appetite/nausea/vomiting

Fatigue

Increased heart rate and breathing rate at rest

Periodic Breathing – (cycles of several breaths and then a long pause) often when sleeping

Sleep difficulties

Light-headedness

Low O₂ saturation

Treatment for Acute Mountain Sickness

Rest and no further ascent

Simple analgesia (Aspirin, Paracetamol)



Fluids (Hydration, Patient should be very well hydrated, urine should be clear and copious)

Acetazolamide (Diamox) This is a diuretic so patient must drink to compensate for loss of fluids.

Antiemetics (anti-nausea drugs, e.g. Stemetil)

If no improvement within 24hrs, descend 500m or more.

2. High Altitude Cerebral Oedema (HACE)

This is life-threatening if not quickly treated.

Often but not always preceded by AMS. Reduced atmospheric pressure which results in lowered oxygen levels can cause fluid retention (oedema) in the brain

Signs and Symptoms of High Altitude Cerebral Oedema

As AMS

Unsteadiness

Severe headache

Visual disturbance

Vomiting

Confusion

Abnormal and irritable behaviour

Loss of coordination and mental functioning

Reduced level of consciousness

Low O₂ saturation

Fits

Unconsciousness and Coma

Treatment for HACE

Immediate descent/evacuation. This is imperative.

Dexamethasone

Acetazolamide (Diamox)

Oxygen and Hyperbaric chamber if any delay in descent

Fluids (Hydration)



3. High Altitude pulmonary Oedema (HAPE).

This is life-threatening if not quickly treated.

Reduced availability of oxygen caused by reduced barometric pressure at altitude can trigger a cascade causing fluid retention in the lungs

HAPE is not always preceded by AMS and so can be unpredictable. It generally develops 2-4 days after ascent to altitude and can come on very quickly, over 1-2 hrs.

Risk factors for developing HAPE are a rapid ascent above 2500m, over exertion, excessive alcohol, cold, medication which may suppress breathing, such as strong codeine, distalgesic, tramadol pain killers or sleeping tablets. Also an existing cold or chest infection or chronic cardiac or chest problems may make people more susceptible, as well as a previous episode of HAPE.

Signs and Symptoms of High Altitude Pulmonary Oedema

As AMS (but not always!)

Breathlessness at rest, which is worse on lying flat

Dry cough with frothy white/pink sputum

Bubbly chest noises (Rales) and a crackling sound like rustling paper (crepitations)

Chest pain

Extreme fatigue

Poor/Pale skin colour e.g. bluish round the lips

Rapid respiratory rate (at sea level a normal resting RR is between 8-12/minute. At 6000m - 20/minute)

Fever

Reduced Level of Consciousness

Low O2 saturation

Treatment for HAPE

Immediate descent/evacuation. This is imperative.

Acetazolamide (Diamox)

Nifedipine (reduces the pressure differences within the lungs which cause HAPE)



Dexamethasone

Sit in a semi-sitting position and loosen clothing

Oxygen and Hyperbaric chamber if any delay in descent

Fluids (Hydration)





3.3 Managing group dynamics

3.3.1 Introduction to group dynamics

As soon as a group of people are brought together a variety of processes concerning group dynamics start. This is particularly true when they share a common goal such as climbing a mountain on an Expedition. Different types of people assume different roles within the group. Depending on the size of the group, there are those who like being in a leadership role whilst others are happy for decisions to be made for them. Some people always seem to be criticising decisions whilst others appear to become the 'jokers'. The group evolves over time, developing through various stages and creating its own unique identity. Some individuals will make compromises for the good of the group whilst others will achieve things they might not have been able to without the support of the group. This group dynamic can have drawbacks when individual responsibility and independent decision making is reduced and there can be pressure or resistance to going against the group decision (for example not wanting to let the team down).

In the following chapter issues concerning group dynamics and the effect they can have on the trek/expedition are discussed. Information in this paper has been taken from behavioural psychology together with recognised phenomena observed on mountaineering expeditions.

3.3.1.1 The group is formed

Here we assume that our group comes together with a common goal as this represents the classic form of a mountaineering expedition. The group development normally follows four sequential phases from their first meeting until the dissolution of the group. Time spent in each phase can vary and some groups never progress to the final phase. This is based on ideas described by Bruce W. Tuckman (Tuckmann 1965). If you take account of these phases when planning group activities or actively create opportunities for positive group development you can help steer the group towards a more positive and advanced stage. By careful management an inclusive and enjoyable group dynamic can be nurtured. One in which an individual can feel secure but does not lose their sense of responsibility.



Fig: Design according B.W. Tuckman (1965)

3.3.1.2 Forming

Forming is the initial stage in the group's progression towards status as a team. It represents the first interaction of the various group members. Individuals want to know how they can fit into the group, what the groups' purpose is and whether they can coexist together constructively. In this phase there is considerable dependence on the group leader and therefore the leader/mountain guide has the important task to play the alpha role (see also Section 3.3.2). From the first contact with the group the leader should demonstrate certain important qualities such as mutual trust, personal responsibility, good organisational ability and quality decisions making.

3.3.1.3 Storming

Once a group has formed it progresses into the 'Storming' phase. This is the power play stage, or sorting out of the hierarchy of influence within the group. During this stage there is limited group identity and cliques vie for control. Behaviour is characterised by strongly expressed views, challenging the ideas of others, poor listening and questioning the leadership and authority of the group itself. This could consist of a client boasting about a previous summit victory or even the fast pace during an acclimatisation tour. It is not uncommon at this stage to have a 'small rebellion' against any kind of leadership. (... "Why don't we go to camp 1 with all the equipment tomorrow?" ...).



As a leader/mountain guide this is an important stage in facilitating group decision-making and to make clear that personal responsibility is important to the harmony and future success of the team. (... "Who believes that it is a good idea to already go to camp 1 tomorrow? Why? "...)

3.3.1.4 Norming

Good guidance through the 'Storm' helps the group enter the 'Norming' stage as smoothly and as soon as possible. At this stage the roles within the team are assigned, group identity is formed and normal group procedures are defined. The group becomes one unit and starts to cooperate according to their capabilities.

NOTE:

The stage of Norming is an ideal time to talk about common values and goals and from that agree a shared code of conduct.

The Leader/ Mountain guide has already had the opportunity during previous phases to observe group members strengths and weaknesses and can now draw on this information when assigning team roles. It should be clear by now who performs well and is suited to particular tasks and who might require special attention.

The leader/mountain guide should aim to create an environment in which individual group members can contribute fully according to their abilities. If this process is successful the group is able to move onto joint action as a functioning team.

3.3.1.5 Performing

The group is now able to solve problems together and utilise the strengths of its individual members. It is transformed into something unique in which there is confidence in the collective and in the role that each person plays. A group identity is created, behaviour patterns include flexibility of contribution, creativity, openness, trust, strong relationships and acceptance of different views.

From a leadership perspective it becomes easier to lead the group. The leader becomes an impulse creator, providing guidance and assistance where necessary with little challenge to their alpha position. On an ideal trek/expedition this phase will have been achieved before the end of the acclimatisation phase, allowing high camps to be established in a stress-free environment and well in time for the summit



day ahead.

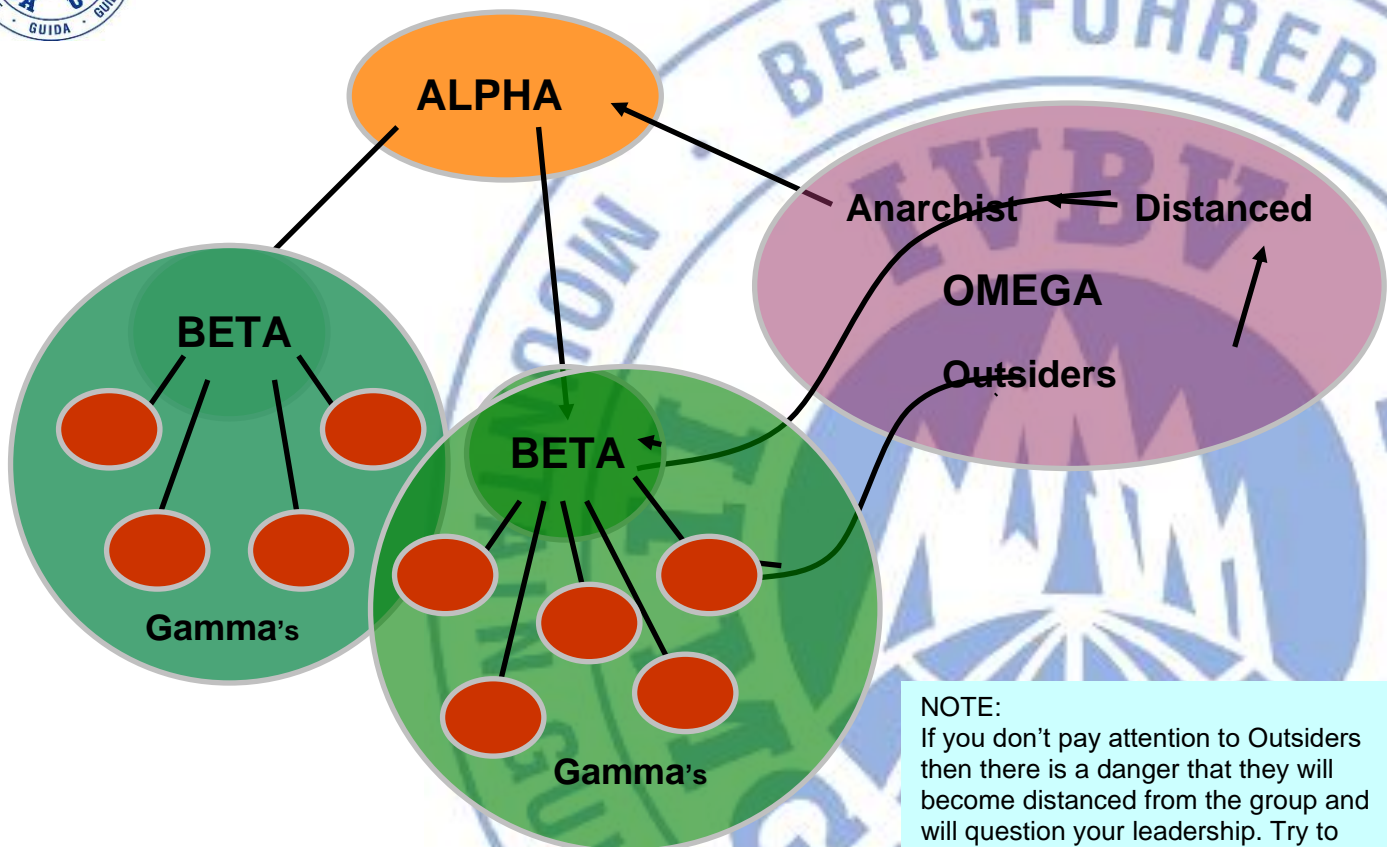
3.3.1.6 Transforming

At the end of the expedition the group will have fulfilled its purpose and now enters the transforming stage. If the group is to continue to exist a new goal must be defined in this phase and perhaps defining new group structure (a new allocation of group roles.) If the group dissolves transforming means going our separate ways and saying our farewells.

3.3.2 Rank dynamics within a group

As mentioned above different types of people will adopt different positional roles within a group. Below, we want to outline the Model of Rank Dynamics by Raoul Schindler (SCHINDLER 1957) and explain how you can manage these different roles and give you some tips to strengthen the harmony and efficiency of the group.

Schindler divides group members into four positional roles - Alpha, Beta, Gamma and Omega. It should be understood that all are present in any group, from groups of best friends to groups of clients brought together purely for a Trek/Expedition.



NOTE:
 If you don't pay attention to Outsiders then there is a danger that they will become distanced from the group and will question your leadership. Try to integrate outsiders into the group and connect people who feel distanced with your Betas. With an 'Anarchist' you should confront them directly and put them on the spot to find out their values (... "What is important for you?" ...)

Fig: own design according to Schindler, R. (1957) and Brown, R. (2008)

3.3.2.1 Alpha

The Alpha roll is the person who offers the group the best or most attractive offer to challenge an external force (the mountain, the boredom, another group). On commercial expeditions during group meetings to discuss tactics or route selection this will usually (hopefully) be the leader/mountain guide. It does not always necessarily have to be the leader/mountain guide, who has the alpha position in the group on other issues because often the group can take care of itself. (Entertainment on rest days, the birthday party at the ABC ...)

Role position can change according to different occasions. The alpha position is determined by the group and it holds, in the broadest sense of the word, the leading and the leadership responsibility of the group. If this position is not clear or if it is



questioned by the group then the group structure will become unstable.

3.3.2.2 Beta

In every group there will be individuals who are happy to listen to the leader, laugh when they laugh, agree with their opinion and extend the Alphas influence within the group. These position roles are referred to by Schindler as Betas. As a leader of a group it is important to know who your Betas are (there are usually more than one). Betas bind the group together and help each other within the group. They spread and share information with the others and ensure that group rules are being followed. The Alpha's management of the group will be easier if they direct their information, ideas and orders through their Betas. Betas are easy to recognise. Who laughs first at the Alphas jokes? Who nods approvingly to an Alpha statement? Who is ready with answers to the Alphas questions?

NOTE:

As an Alpha you should be there for
NOTE:
Identify your Betas. They will help you to guide the group harmoniously.

3.3.2.3 Gamma

There are more Gammas in the group than other positional roles. They also perform an important task. Collectively they determine the mood and harmony of the group. They are responsible for a group or team failing to achieve its target. They are the worker bees and the coordination of their efforts will determine whether a project succeeds or fails. Gammas listen to Alphas and are encouraged by Betas. From within the Gamma corps new Betas can develop as can new Omegas (the outsiders of the group positional roles). Omegas will appear if Alpha leadership is lacking or if they overlook the welfare of the group. Preventing Gammas from changing to Omegas is one of the most important tasks for the Alpha. Actions such as, getting the group to take a break before the weakest members struggle; providing the group with timely information in advance of speculation; striving for a supportive and inclusive environment; setting a positive example; are all small but important actions that can arrest the development from a Gamma to an Omega.

NOTE:

Without Gammas nothing happens. They are the worker bees and demand to be lead properly.

3.3.2.4 Omega

The omega positional role is by no means bad or evil, it is quite the opposite.



Omegas take a lot of pressure from the group. They often say what others are thinking but do not have the courage to say. As slightly weaker link in the group they remain in the background (Outsiders) and allow more space in the group for the other roles to operate. It becomes problematic when Omegas openly criticised the ideas and leadership of the Alpha (Distanced) or even tried to take over the leadership role (Anarchist). This attitude can develop through fear, weakness, over or underutilisation within the group, having very different values compared to the rest of the group and for many other reasons. An Alpha can arrest this Omega development early by helping an Omega understand that each individual in the group with their doubts, fears, values and skills will be taken seriously, respected, and responded to accordingly. For example; "I understand that some of you are wondering why are we still here, well let's finally go to the summit ...". If the group and Omegas know that the Alpha understands the needs and ideas of the group then the development of "outsiders", the Distanced-Omega and Anarchist-Omega can prevented. It is therefore a good idea to create an inclusive and supportive atmosphere within the group early on in its development.

NOTE:

An Omega is not necessarily your enemy. They will often question you but their attitude often relieves pressure from the group.

3.3.3 Leadership Styles and Methods

Different types of people prefer to be lead in different ways. Some people want to be led by someone they can look up to, almost like a hero, whilst other people cannot stand that kind of adulation (client or leader!). Sometimes you must advise, sometimes you must consult, sometimes you have to be sensitive and sometimes you have to be firm and direct. Anyone who has ever worked with groups understands that a single leadership style does not suit all situations. It depends on the individuals within the group, their skills and motivation, as well as external factors (goal, time pressures, threats or dangers etc.) as to what leadership style or mix of styles will work best. The skill/experience level of an individual given a specific task is an important factor to help a leader/mountain guide manage their clients appropriately.

NOTE:

Sometimes it takes a hero... but these occasions are rare.

- **Low experience level/ little skill:** The group needs a clear plan about what, when, where and who is to do things. Only then will this group be successful and achieve their goal.

- **Intermediate experience level/ moderately skilled:** The group brings with them some previous experience but still lack the skills to being able to act independently. It is recommended that the group is included in and participate significantly more in group processes and decision making.

NOTE:

The competence of your party and the given situation determine the leadership style that is appropriate.

- **Highly experienced/ highly skilled:** The group has a high level of skills and can act in harmony in terms of their values . The group is strengthened by the confidence and faith that the Leader has in them. Tasks can be accomplished independently. Leadership which is based on personal responsibility and trust is likely to be most successful.

What now follows are three known leadership styles according to Kurt Lewin (LÜCK 1969 after Lewin) and an recommended approach to trek/expedition leadership.



3.3.3.1 Democratic – cooperative

The democratic style is the most widely used leadership/management style. The group leader acts as a chairman and facilitates the

group decision making process. According to the situation the leader or another member of the group allocates tasks for the group without being authoritarian.

Decisions are made jointly and as a result the opportunity for learning is particularly high. If the group has good communication these processes will work well but they can and do often take a very long time. If the group is able to work it out for itself and operate independently and harmoniously the leader can remain in the background and keep an overview. In democratic decision making certain individuals (usually those particularly strong or weak members) often have to adapt to the other members of the group. This can place considerable pressure on those individuals. Despite these disadvantages democratically led groups have a much higher chance of existing for a long period of time.

NOTE:

Advantage: Motivates the group to get involved. Disadvantage: Often takes a long time to reach a decision.

3.3.3.2 Laissez Faire

"Laissez faire" means 'hands off' or '*let it happen*'. The leader of the group does not play a significant part and does not enforce or even encourage decisions to be made.

There is a belief that the group will be able to determine its own direction. Decisions in these groups are made very slowly or sometime not made at all. It often leads to

sub-groups or cliques forming and unpopular participants being excluded. There may be rivalry between the sub-groups and this inharmonious action means that the group rarely achieves its goal. The learning value is low and it is unlikely that the group can exist in this state for very long. If no major actions or tasks are planned it might make sense to let the group "relax" and allow them to drift in this fashion but it is not a very productive state.

NOTE:

Advantage: Group operates self-determined
Disadvantage: Often disoriented because leadership is lacking.

3.3.3.3 Authoritarian

In this leadership style decisions are made by the leader on behalf of the group.

There is no discussion and usually no justification given to the group. The learning



experience possible in this style is low. It tends to generate a sense of disengagement from the group and selfishness and can be demotivating for group members. The clear advantage of this leadership style is the speed at which decisions can be made. Clear “commands” mean time is not lost on discussion and gaining agreement for a decision.

NOTE:

Advantage: Fast decision making and ability to act quickly.

Disadvantage: de-motivating and discourages personal

The chances of achieving a goal are often higher with this style of leadership but at the expense of group autonomy and longevity. The group is able to act but often only for a short period of time. In many situations where there is imminent danger (storms, avalanches, rock fall, and dangerous terrain) an authoritarian style of leadership is essential.

3.3.3.4 Integrative Collegial Approach - the FEL model

As a Leader and Mountain Guide one leadership style alone is inappropriate for a single day let alone an entire Expedition. Environmental conditions and circumstances often change too quickly for it to be appropriate to lead a group in a democratic or ‘laissez faire’ style. However, a style that was unnecessarily authoritarian would stifle the fun and enjoyment of the group and wouldn’t be very pleasant for the Leader either. So clearly a leader/mountain guide must adapt their style to the circumstances. This will often involve balancing different aspects of these styles to find what works best for a given group. It would be inappropriate to give strict and precise commands to a group concerning lunch on a rest day, just as it would be to have a long and inclusive discussion about whether to descend from Camp III to a lower camp if there was an approaching storm and increasing avalanche danger.

NOTE:

FEL means Feeling, Exposing, and Leading.

FEL – Model in this context means:

Feel what the group/individual needs.

Expose common values and objectives (safety, success, and self-awareness).

Lead (leadership) give direction, and ensure you go in this direction together.



3.3.3.5 Differences in perception

We should never assume that our fellow human beings (customers, friends, partners) see the world exactly as we do. We all perceive, feel, engage, understand and interpret events and interactions slightly differently from each other. Almost all misunderstandings in relationships and in leadership arise from these differences. It is sometimes very difficult for us to fully appreciate someone else's perspective. For example something that seems simple to us, such as crossing an exposed drop might cause another to be so frightened that they become blocked and cannot move any further. It is very important that we try to see the (perceptual) world of our clients. This is the only way to be sure that we do not misunderstand each other. Only then can we expect that our orders will be properly understood and correctly interpreted and implemented.

NOTE:

We all see the world from a different perspective from our fellow man.

3.3.3.6 Conflict Management / Conflict Resolution

Even the best trained leader/mountain guide who leads their groups with skill, empathy and good guidance will undoubtedly encounter conflict within their groups at some stage. Not all conflict within a group is of the same severity. There are different levels of conflict from avoidance or refusing to talk to someone, to open verbal or physical confrontation.

Conflict in any social structure often develops from different values and/or perceptions. The best way to prevent such differences developing is with good, clear communication within the group. It is therefore very important to create opportunities for open discussion within the group. Communal meals are an excellent time to discuss things as a team, but this could also happen during a relaxed ascent during acclimatisation or whilst playing cards on a day of rest and so forth. It is often necessary for the leader/mountain guide to broach the chosen subject with the group. The leader operates as a moderator and endeavours to ensure that all members of the group have a fair hearing. To achieve this it is important to understand a few simple rules concerning communication.



Communication should be:

- **At the same level.** Transmitter - receiver should be at the same level. This is important both psychologically and physically. Messages delivered "from above" crush the receiver, and it is harder to push the message "up".
- **Crystal clear.** Be as clear and concise as possible. Use simple examples, without personalising statements or using accusations. The leader should put the group "we" or individuals involved "you" at the centre of any resolution and avoid their own opinions "I".
- **Position.** The participants should be clearly visible to the group at the same eye level. A circle is ideal because everybody can be seen and everyone is equal.
- **Eyes on.** Have good, but not intimidating eye contact with the person you are speaking to. The eyes are windows on the soul- he who looks has nothing to hide.
- **Who? What? When? How? Where?** It is better to ask questions than to give answers. Think about successful TV presenters... they engage their guest, ask questions and get them to relax and open up.

Conflict is not pleasant within a group but we should keep in mind that within every crisis there is an opportunity. A conflict indicates that there is a problem with the development of the group at a relationship level. It is therefore essential to steer conflicts in the right direction. The learning process for each individual can be rewarding. The following steps concerning control and problem solving (LERCHER 2001) are very useful.

NOTE:

Conflicts often arise in groups because of different value systems, standards, personality features or different interpretations of the same information.

- **Problem analysis and definition.** The situation is described and is split into "Status" and "Target". It is important that all participants have, or can develop an awareness of the different values, ideas, norms and requirements of each other.
 - What is your ideal solution?
 - What expectations do you have when the problem is solved?
- **Whole group participation.** The entire group must be involved in getting to the base of the problem. It is important to get to the root of the problem in order to



achieve a lasting solution. (It isn't the fact you leave the toothpaste tube open that upsets me... it's the fact that you don't seem to listen and aren't taking the problem seriously). Ask yourself: what concerns/fears/issues/desires lurk behind the accusations?

The following structure will help to get to the bottom of the problem and to make the first step:

- How willing are you to deal with the problem?
- How much do you really want to? On a scale of 1 (not keen) - 10 (very keen)?
- How great are the differences between "status" and "goal"?
- How desirable is it to make this "difference"? (Scale 1-10)
- **Collect options.** Does the group find it desirable to pursue a solution? From this possibilities can be developed:
 - How can we be motivated to make this "difference"?
 - Are there any existing solutions? Have these been successful?
 - Collect as many (old and new) solutions (whether good or bad).
- **Evaluate solutions.** The assessment is made by all the participants. Using a points-system has been used with success (3 points = I like it, 2 points = Acceptable, 1 point = Manageable, 0 points= Unacceptable).
- **Make a decision.** The group must develop an acceptable strategy. If the decision is liked and acted upon then there will be no room for retrospective criticism. Any criticism should be openly and clearly addressed at this stage.
- **Execution.** The implementation of any action within the group should be discretely monitored by the leader/mountain guide.
 - How is it looking? Are we on the right track?
 - Do we keep to our decisions?
 - How do I feel personally (each individual) about the direction we are taking?



- **Evaluation.** A conflict has been solved once the group does not see any difference between the "Status" and the "Goal". At this point there is no "right" or "wrong" anymore on this issue.

3.3.3.7 Reflection and Feedback

Through reflection and feedback we can increase the potential for a group to achieve their goal. It helps achieve a harmonic structure within the group and maximises the learning opportunities for each individual.

With feedback one receives or gives a response to an action. Ideally feedback should be delivered in a constructive way, including two or three positive observations. This can be followed by a suggestion for improvement – and it is here that the greatest learning potential is packed. Feedback should always be finished with a positive conclusion.

With a reflection the group shares their perceived experiences of an event with each. For example "what I experienced today, what I have learned and what I found particularly useful or helpful and improved my learning and might be useful for others in the group." With a reflection there should be no feedback to the leader or another client. It is more about sharing experiences and identifying differing perspectives which might form future possible conflicts. Talking about these things in an open, accepting and positive environment helps the group process differences and avoids conflict before it appears. An experienced leader/mountain guide will have their own manner and style for running a reflection process. Over tea or even a beer many issues, feelings and perceptions can be discussed without overcomplicating the situation. It is important that the leader/mountain guide allows time and space for this process and does not simply hide away in their tent.

NOTE:

Feedback: Information gained in response to an action.

Reflection: A look back on past actions and their consequences.

3.3.4 The Collective and its dangers

In recent years we have been able to better understand and identify sources of human error in mountaineering. For example with respect to avalanche accidents we can show that in 90% of accidents human error has been at fault. The psychological component of mountaineering accidents is referred to as the Human Factors or



“Heuristic Traps” (see McCammon 2002). Without elaborating on the psycho-social background, in the following paragraph we have stated the most common of these “Heuristic traps”.

3.3.4.1 Lion syndrome

This highlights the danger of the desire to be the first to a summit or to ski fresh tracks on a slope. Beware: This state of mind often leads to small but important details concerning safety to be overlooked.

3.3.4.2 Acceptance / Social Facilitation

In groups of experts or people of similar experience level no one enjoys being the one who turns around first or has their weakness highlighted. Groups who have previously encountered other groups often expose themselves to more risk than groups who find themselves alone. Inexperienced groups seem to become more cautious after meeting another group whilst more experienced groups seem to take more risk.

3.3.4.3 Scarcity

After waiting a long time in bad weather we often feel pressured to make the most out of the first good weather day and turn a blind eye to warning signs. Indications that might otherwise might have discouraged us from skiing a potentially dangerous slope. When anything is in short supply it seems to exert pressure on us. Whatever the motivation a strong sense that we must seize the moment or lose a valuable opportunity should be a warning sign to take a deep breath and question whether we would make the same decision if the opportunity was secure.

3.3.4.4 Consistency

People have a tendency to remain committed to a choice of action even when new information suggests that “staying the course” might not be such a good idea. When we have decided, we tend to do as planned and resist changing our minds. This can be particularly true of mountaineers because at times you need to have a certain



hardness and determination to achieve your goal. This attitude can blind us to new information which might have made us make a different decision.

3.3.4.5 Familiarity

People who are very familiar with an area tend to overlook warning signs and assess the area to be safer than it actually is. In part because they feel more relaxed there and feel they have more control over the area. Investigations have shown that accidents occur more frequently in areas which the victims were very familiar with. Curiously, familiarity seems to have the strongest effect on highly trained groups.

3.3.4.6 Non-Event Feedback / Dealing with probabilities

After climbing a mountain successfully we can reflect on our success, just as we can after safely skiing a steep slope during a high avalanche risk. However we never know how close we were to triggering that potential avalanche. We do not have the opportunity to determine how small or large our margin of error was and this prevents us from learning properly from our experience. It is possible that we have taken a large risk and statistically we just came away lucky. To the human mind a non-event confirms we made the right decision. But if we frequently experience non-events with constant exposure eventually we will have an accident.

3.3.4.7 Sheep syndrome, Herd instinct, Risk-Shift Effect

At times we blindly follow the person who goes first and it doesn't matter who it is. We feel more secure in a group than we actually are. We tend not to question anything in a group. In certain circumstances this can suggest to the leader that all their decisions are correct. Large groups have a higher willingness to take risks than small ones. This is often because everyone thinks the others would say something if it was too risky.

3.3.4.8 Horse syndrome.

In uncomfortable situations we often want to be 'back in the stables' as quickly as possible. For example when bad weather arrives we can act rashly in order to get home as soon as possible. This can lead us to ignore planned procedures and overlook potential danger signs.

3.3.5 The individual and his fears

The emotion "fear" could also be called "an automated negative thought flow" (BRAUN, 2010). It is often inexplicable, at times useful but mostly we feel somehow ashamed of it. This should not be necessary as fear is a source of protection for us and offers us an opportunity for personal development. No matter what it is we fear (Death, pain, growing old, failure...) we can overcome it and start to understand the deeper meaning behind it.

As guides we are often a confidant for our clients. It is important that we take the fears seriously when they are trusted to us. Even if it is difficult to understand these fears we should always treat them with respect.

3.3.5.2 Forms of Fear - Discomfort, Stress and Anxiety

We have all experienced different stages of fear. From the nervous inner restlessness when we climb an alpine route (... "The weather is a bit gloomy and we're not really sure. I would rather go sport climbing... why is my partner so quiet...? Well, I'm not going to be the one to turn around now.") We have probably all experienced this type of unease. It is characterised by frequent negative thoughts or comments on external conditions or negative judgments about our own condition. For example, "I don't feel right today; my stomach is a little upset...". This phase can often do some good. As a result of it we experience a special form of concentration becoming more alert and aware. One can usually see a certain protective function in it.

The more opportunities we have to experience these feelings and attach positive experiences to them the better we get at dealing with them. This is a learned competency. Unfortunately it is more common in our lives that we link such preliminary stages of fear with negative experiences (test anxiety, fear of failure...). As a result, future learning is made more difficult for us because we become dominated by negative emotions. If we ignore or miss these initial indicators of fear then nervous excitement can quickly develop into deeper fear and panic. At this



stage usually very little helps. Someone in this state may become irrational or immobilised by their fear. We get stuck, both physically and mentally and it becomes very hard for us to find a way out of this state. If that happens to one of our clients on an exposed ridge, we will need more than just a casual "Nothing can happen here" to save the situation. Working on the rational level in these situations often will not work. What seems clear and understandable to us ("The ice-screw will hold and the rope will not break") is far from obvious to someone gripped by their fear. If you approach the problem on a rational level you may not be able to solve it. We may never know what hides behind our clients' fears and that is why we must approach such problems very openly.

3.3.5.3 Methods

In principle it is not our job to try to resolve the fears of all our clients. Our first expectation has to be that our clients have coped with their fears in the past and know how to manage them. However should we encounter unexpected difficulties or particularly dangerous situations for ourselves or for the group, then it would be advisable to know some methods for dealing with fear – your clients and your own.

3.3.5.3.1 Attitude and preparation

- **Take the drama out of the situation.** When someone is afraid we will only make things worse by showing our own fear, restlessness or nervousness. As a leader/mountain guide we should try to act and speak calmly and not get drawn into the clients' drama.

3.3.5.3.2 External direct help

It is important to be sensitive to the individual and not cause unnecessary additional harm but in some situations there is little space or time for a delicate approach. In dangerous situations the safety of the client(s) is of overriding importance. This doesn't mean we should try to help someone in this state by "slapping them in the face", but that we must offer appropriate security and trust. The following policy – CDP – proposes a quick, practical approach (also see Schädle SCHARDT-2002).

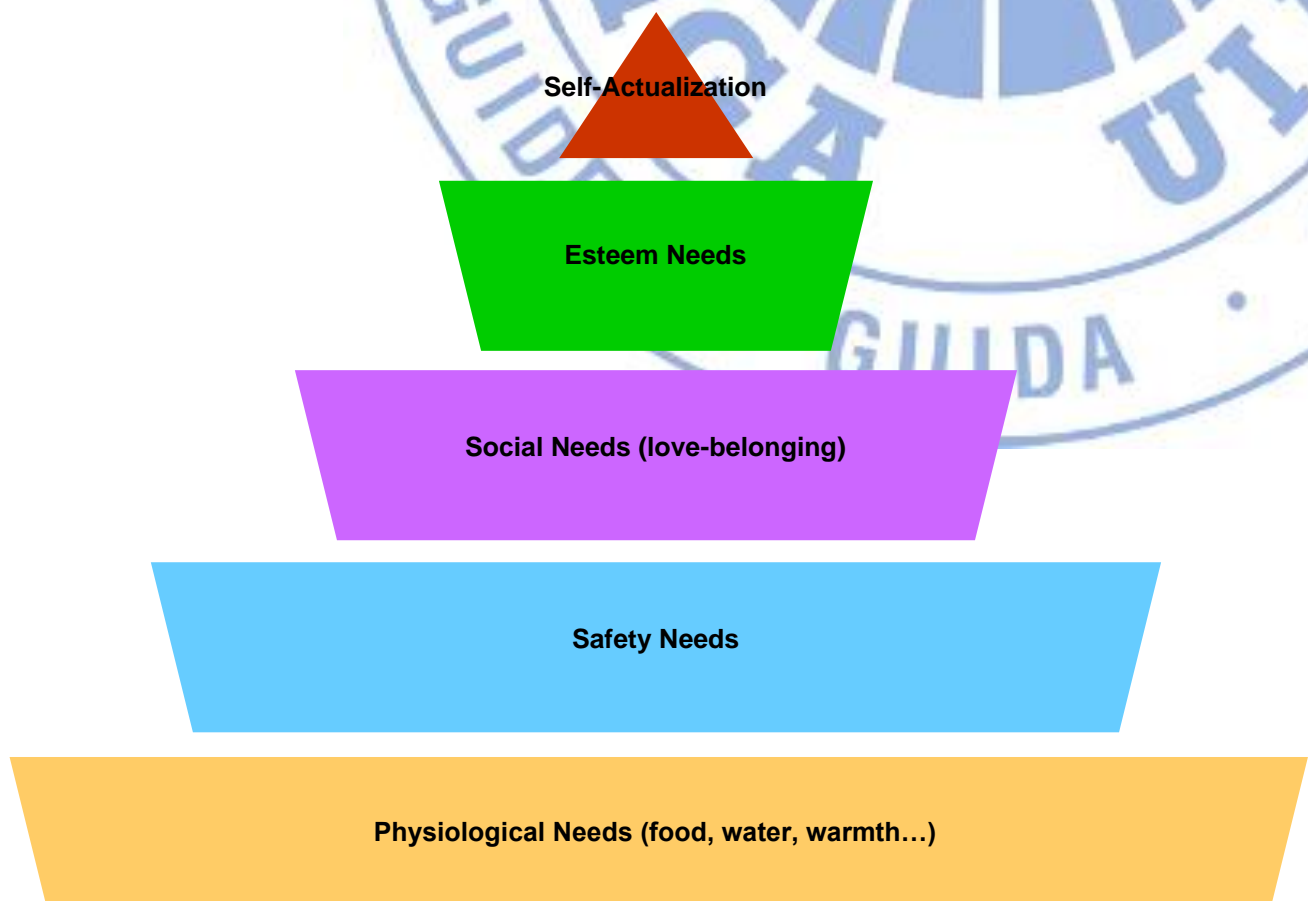


- **Calm down.** First we have to stabilise the situation. To help we can try to encourage a calmer and deeper breathing pattern, try to reassure them (by calmly asking question) or we can remember an internal mantra (self-instruction).
- **Demonstration.** Calm, clear, physical instructions are helpful. ("Step back now, hold on tight here"). Negative or "hidden commands" (embedded commands) such as "You must not slip", or " don't look down" are processed immediately when in this state and the affected person may well do just what you tell them not to (they will look down...). Keep movements as simple as possible. It can be useful to remember a popular tune or children's song to keep moving in a rhythm.
- **Praise.** Positive encouragement enables a much smoother learning process than criticism. Praise your customers when they do something well. Try not to exaggerate and be sincere.

3.4 Camp Management

In terms of 'infrastructure requirements' an expedition base camp can be compared to a small village. Organising all this requires good management skills.

Maslow's Hierarchy pyramid of needs (1908 - 1970) is a good model which summarises basic human needs. It ranks these human needs in the order in which they need satisfying. From the basic physical need for food, water and warmth, to social needs for recognition and a sense of belonging and onto the more abstract psychological need for self-realisation. During the many weeks spent together on the trek/expedition the leader must have an awareness of these needs. For a mountain guide the main task is ensuring that basic needs are properly met.





3.4.1 Supply and disposal tasks

Daily but essential tasks include supplying food and drinking water along with the provision of water for cooking and cleaning, supplying electricity and providing heat and energy (from gas, gasoline, etc.). There is also the disposal of sewage and garbage to be taken care of.

Food

Food hygiene must be given a high priority so that it is safe and enjoyable to eat. Hygiene standards must be maintained so that contaminated food does not lead to having to abandon the trek/expedition. Simple procedures can help control food hygiene. It is helpful to brief local partners on normal group members diet. It is also a good idea if the leader is involved in the selection and purchase of food as well as being available to give advice and monitor hygiene in the kitchen. If you are personally expected to prepare food it is a good idea to have experience of this before the trip.

Resupply of and accounting for food stocks is also an important task both on treks where food has to be carried for weeks at a time, and on expeditions which can spend considerable time in base camp. Good planning in advance, combined with accounting and resupply plans should ensure that you do not run low of certain foods. It should never happen that the food becomes rationed or has to be rationed. This can only result in reduced physical performance due to insufficient energy and can have a disastrous effect on team morale. Experience has shown that well prepared, varied and tasty cuisine has a powerful effect on groups and helps them rise to difficult challenges on the mountain. With monotonous food or malnutrition even the best trip loses its appeal. A good leader/mountain guide cannot put enough care into ensuring good quality food for the clients and the support team (porters, cooks, etc.).

Making time to clarify certain things in advance (food preferences/dislikes, food intolerances/allergies) helps avoid being caught out unexpectedly during the trek/expedition.

NOTE:

Balanced nutrition and a varied diet will increase the performance and the motivation.



Drinking water

Whilst it is possible to survive for some time without food we must drink water daily in order to survive. On treks/expeditions which involve greater physical exertion the water requirement per person can increase to up to 5 litres per day. This amount of drinking water is almost impossible to prepare by filtration alone for large groups. In any case it takes a great deal of effort to provide enough good quality drinking water. Contaminated water is the most likely cause of gastrointestinal complaints for clients on tour. This is especially true for treks where a new camp space is prepared and occupied each day. It is recommended that the leader/mountain guide goes together with the kitchen crew to look for clean water.

NOTE:

Clean water is essential for treks and expeditions!

On Expeditions you must select the location of base camp well so that good water is not far away. If there is not clean spring water available then all water must be boiled well (not only warmed!). This includes all drinking water, water used for cooking and any water used for cleaning your teeth!

At high camps or whenever you have to make water from snow, the management of water treatment becomes a special job. Normally at least one person is permanently occupied with getting snow and melting it. Only with sufficient warm drinks (tea, electrolyte drinks, soup, etc.) can we ensure that the body functions properly. When the temperatures outside are low it becomes especially important to drink plenty of hot drinks because it helps maintain a good body temperature.

To ensure that water sterilisation is done as efficiently (time and energy) as possible good equipment is required (efficient cooker and cooking systems, pots with heat exchangers, windshields, dark plastic bags for collecting and melting snow, etc.) It is also very important to have experience and knowledge of how best to use this cooking gear. This included the proper use of the particular fuel source (gas or liquid fuel). (see the chapter on equipment).

Water for daily use (useable water)

The longer you are on the mountain the more important it becomes to provide additional useable water. Primarily it is used for washing kitchen utensils and for personal care. It is water that is relatively clean but has not been sterilised.



For brushing teeth, intimate personal hygiene or cleaning wounds on the body (e.g. blisters) you should use drinking water. To ensure germs are removed from kitchen and eating utensils use a good amount of environmentally biodegradable cleaner in “useable” water. The final rinse can then still be done in hot, sterilised water. If the initial “washing water” is little sandy or made from melted snow it should not be a problem - it is only important that it is not polluted.

Solar showers have also proven to be enormously useful on treks/expeditions. There are many reusable, low weight and low cost options available including black shower bags that can serve this purpose. When the sun has warmed up the water up you can simply hang the bag up and enjoy a wonderful shower.

The leader/mountain guide is responsible for the regular provision of usable water for both clients and staff, although it will be the kitchen crew who practically arrange this. The more challenging the expedition the more autonomous the clients will have to be in terms of providing enough water for their needs. Of course this requires knowledge and guidance and that will have to come from the leader/mountain guide.

Disposal tasks

Without the availability of modern disposal facilities we must consider the best ways to deal with various types of garbage; faeces, kitchen waste, everyday rubbish and sometimes more hazardous waste. Faeces are particularly important because poor disposal can lead to the contamination of local drinking water. The selection of a suitable campsite depends not only on a good location for the toilet, but also where toilets have been located in the past. In areas without specific rules for dealing with faeces it is best to select a place where a deep hole can be dug at least 60 meters away from trails and water sources including glaciers where a deep hole can be dug (Note: don’t forget to bring a spade!). For one night camps a simple screen can be used to respect privacy, for camps of longer duration it is worth taking time to make the place more comfortable. It is important to take into account the relevant cultural practices of the local population, clients and also the staff. When you leave the camp the hole should be properly filled with earth or stones so that nobody can see or smell any of its content.

Organic waste from the kitchen can either be disposed of at the toilet or by digging another hole near the mess tent. Leaving piles of waste in the open is far from ideal



as birds; foxes and other animals are drawn to it and will scatter the waste all over the camp.

Rubbish made of plastic, broken equipment or special waste like batteries should be collected and carried back to civilization so that it can be disposed of properly. It is important to bear in mind that waste management capacities in many countries are low and mainly consists of unsanitary landfilling and open dump sites, which also cause a lot of environmental damage. Only getting waste off the mountain may just be displacing the problem, guides and clients therefore should plan for waste minimisation from the planning phase. The leader/mountain guide is responsible for ensuring that the group adheres to rules of sustainable travel.

3.4.2 Camp Construction

To ensure a successful Trek/Expedition the Leader/Mountain guide must have the knowledge and practical skills to be able to coordinate the construction of a good campsite. Choosing good location for tents is an important part of this.

Planning camp construction

The first question to ask is whether there is enough space to fulfil all of the Camp functions. If there is enough space you must decide how to use it in the best possible way. In selecting a site although it might seem ideal Base Camp at 6.000 meters we know that there are good physiological reasons why it should not be sited above 5.000 meters.

The position of a client's tent can prove an explosive point in group dynamics. Some sites will always be considered better than others. Selected sites must balance the need for privacy against the need for safety and the distance from the toilet. The leader/mountain guide should try to be sensitive to the needs of their clients but be firm and clear about any requirements that should be followed; without any need for major discussions.

When travelling in "unsafe" areas of the world the dangers of theft and robbery should not be underestimated. It is often safer to camp inside villages or on the outskirts of them rather than more remotely where you are completely defenceless. At other times it might be more appropriate to site your camp away from civilization so as to be spared from theft. When there are fixed areas for tents (sometimes even



mandatory) you should use them because they normally have some facilities with them and National Park authorities keep a watchful eye out for tents sited illegally.

Objective safety of the campsite is another very important aspect to consider. Is the camp protected from wind, avalanches, rock falls, falling ice, floods, mudslides, etc.? At times a compromise may have to be made and a less ideal site selected but objective safety must take priority. There have been major accidents in the past (even involving guided groups) where entire campsites were fatally subjected to one of the dangers mentioned above. When pitching tents it is essential that the ground under the tent is dry and flat and that they are well anchored. Under no circumstances should you allow yourself to be lulled into a false sense of security by good weather conditions and cut corners. Poor or sloppy siting of tents will be paid for during the next downpour.

NOTE:
Safety is the most important aspect for the camp!

3.4.3 Technical Infrastructure & Logistics

Depending on the Aim of the Expedition and composition of the group it might be necessary to provide or operate certain technical infrastructure. The main point here is usually the provision of enough electricity. Electricity might be required for lighting or to recharge electronic equipment such as music devices, computers or cameras, for the provision of communications via satellite telephone and the internet.

There are various effective and efficient ways to produce power on expedition for example through solar panels or wind generators. To remove any nasty surprises you should make sure that you test the equipment at home and check its compatibility (See section 1.6. Communication and power).

It should be well understood that as a leader/mountain guide on a tour you have to be well organised. There is your personal gear and the group equipment to keep in order. It is not easy to keep track of everything (empty/full gas cartridges, hundreds of meters of fixed rope, ice screws, snow stakes, tents, high altitude food etc.) so it is essential that you have a good system in place to manage logistics.

Trust and fairness are very important within the team because it would be easy for an individual to feel disadvantaged because they have been given a slightly older stove,



or had to carry a heavier rope or somehow missed out on their favourite desert powder. In allocating equipment systems should be as transparent as possible to keep problems to a minimum and help resolve them faster.

Logistics also includes organising the resupply when important things run out. If there are other groups on the same mountain at the same time then they can often help each other.

Establishing good communication links early with other groups and maintaining a good atmosphere (perhaps inviting them over several times for tea) means that any requests for help will be well received. At the same time information concerning the situation on the mountain can be shared. If nothing can be sourced locally you may have to improvise or order resupplies from outside.

Note: Only pay for goods when they arrive in camp (or at least complete payment)!

NOTE:
Successful leaders are always experts at managing Logistics!

3.4.4 Social Infrastructure

During long treks/expeditions provided the physical and security needs of your clients are satisfied it is a good idea to turn your attention to their social needs. Some guides may say at this point that they don't want to or don't have time to worry about this. However if you are able to establish a social rapport with your clients it can often make your role as a Leader and manager much easier. Interpersonal problems that have the potential to cause a lot of stress can be reduced or avoided altogether. The whole experience will be enriched not only through the attraction of the country itself but by the positive group dynamic that is generated.

Keeping focused and motivated

On expedition the main focus is summiting the mountain or the goal. We often get so focused on the task in hand that we miss out on other wonderful things around us. This is a great shame because every country offers far more than mountains. This intense focus on a single goal can become too much for some people. It is essential that we don't lose track of the essentials and are able to switch off for a while and lighten our thoughts.

Lots of things can help here, an exciting book (not necessarily mountain literature), a visit to a temple, a stimulating conversation about philosophy. Lot of things helps us



switch off; allowing our thoughts to run free, to escape the existing monotony and re-motivate us. Playing cards and simple board games are particularly useful in adding variety and excitement. They can also help to strengthen group dynamics or broaden your horizon.

Sexual interactions with the clients are not recommended. The relationship between the leader/mountain guide and the entire group always suffers more than it is promoted.

Skill based games are both rewarding and distracting. Juggling balls, a slack-line, or frisbee provide great entertainment whilst waiting or on a rest day and are quick to learn for beginners. It always pays off if you as a leader put some time and effort in maintaining and strengthening relationships within the group.

3.4.5 Medical Infrastructure

It is essential that a trek/expedition has the facilities to deal with certain medical emergencies. It is not always possible to have a physician in the team, particularly one with experience in wilderness medicine. It therefore falls to the leader/mountain guide to do the best job they can. Their first responsibility is to try to ensure that all the clients stay as healthy as possible throughout the trip. It might be necessary to discourage or even forbid someone with long hair from washing it in the evening as they could easily catch a chill. Or to take away some local “delicacy” that has just been bought. If your clients understand that your actions are for their best intentions and you use a little humour then you shouldn’t have any difficulties.

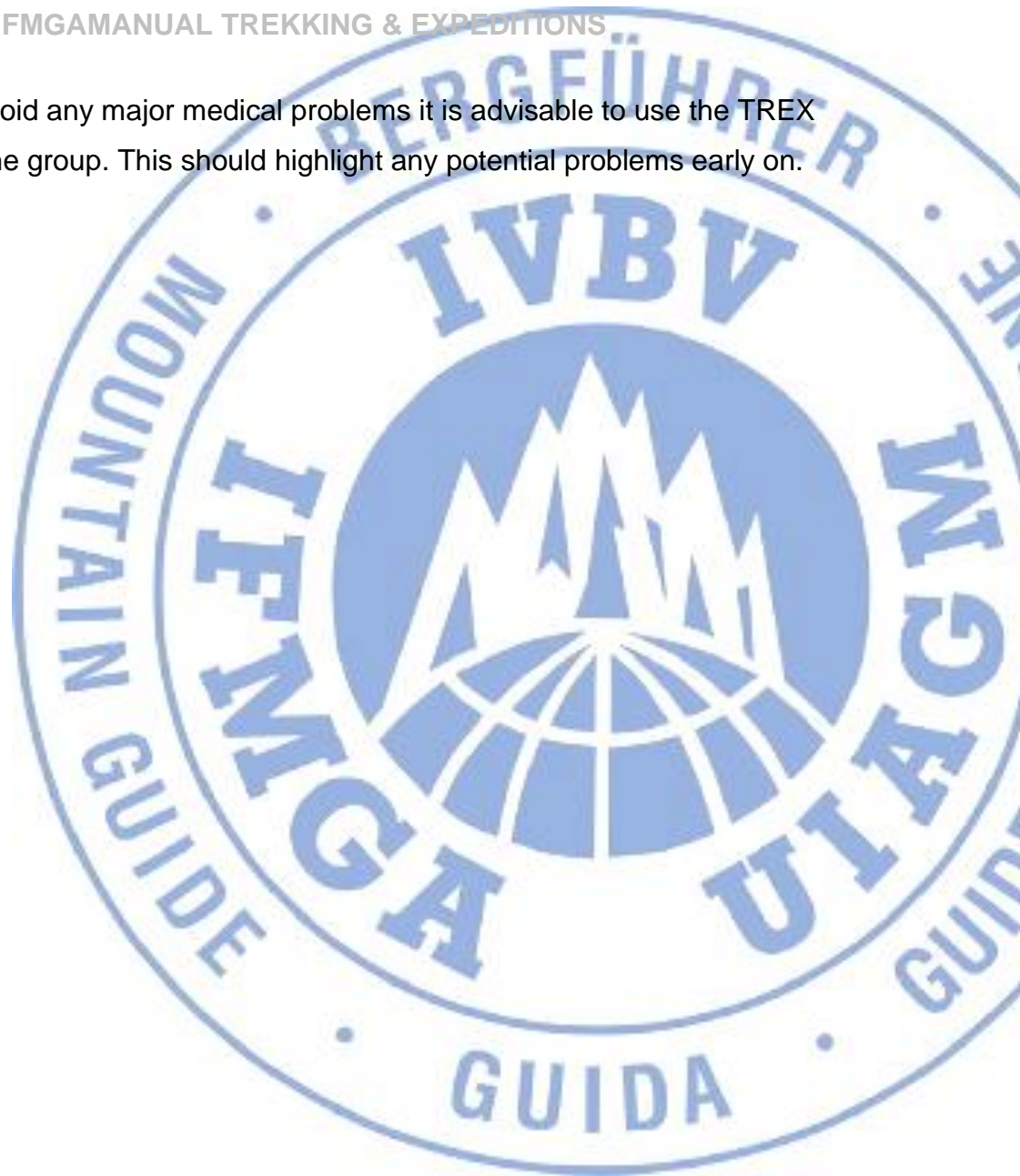
NOTE:
A knowledgeable and experienced Mountain guide can be a better medic than a clueless doctor.

If for any reason someone does get sick then you must give them the best possible support to try to get them back on their feet. This is usually in the interest of the entire group as such failures can affect the journey in a very negative way.

It should be obvious that the leader/mountain guide must know about all the medication that the group carries and how to work with the relevant emergency equipment (Certec/Gamow bag, oxygen, etc.). A comprehensive group-pharmacy is just as important as educating the group-members about what to do in an emergency. An education in high altitude medicine should be part of the national guide courses.



In order to try to avoid any major medical problems it is advisable to use the TREX health check with the group. This should highlight any potential problems early on.





3.5 Risk Management

We cannot ignore the possibility that at some stage despite our best intentions we may encounter an emergency on a trek/expedition. In order to reduce our chances of this and to better prepare ourselves to deal with this eventuality it is important to understand basic risk management.

Mountain sports and expedition climbing in particular are different from other sports in the fact that not all risks are obvious or can be identified at first sight. Situations in the mountains are too complex and involve too many variables for us to fully understand them through knowledge and experience alone. When traveling to more remote corners of the globe there are an additional variety of dangers that you might never have expected. In reality this means that you not only have to deal with the standard risks associated with alpine climbing such as falling, avalanche danger or hypothermia, but also the more unusual risks of disease, crime, traffic accidents or even political unrest.

Knowledge and experience are an essential foundation but they can never wholly prepare us to deal with all unforeseen eventualities. This brings us to the subject of Risk Management and a strategy for handling different and unexpected challenges.

3.5.1 What is risk management?

To discuss risk management it helps to understand the term "Risk".

We can understand Risk (R) as the product of the Probability of the event occurring (P) multiplied by the Extent of damage (E). So we have the equation $R = P \times E$.

Risk Management is often defined as the strategic handling of Risk. It describes a way in which a systematic effort is made to reduce the two components of Risk, its Probability of occurrence and Extent of damage.

Risk management is a tool which can help us deal with complex situations using relatively simple methods and basic considerations. For it to work we have to recognize and follow certain procedures, rules and limits.



A classic example of risk management in mountain sports are the changes to avalanche training and theory over recent years and the new guidelines on crevasse rescue training (direct back up, partner check, more anchors, etc.)

Risk management means you must adhere to certain standing operational procedures. Standard operational procedures are measures which should be applied on every occasion even if the individual assessment of a specific current situation deems it necessary or not. For example, in everyday life the use of seat belts whilst driving has become a standard operational procedure. Although it does not reduce the probability of a traffic accident occurring it significantly reduces the possible extent of damage (degree of injury).

With this in mind there are a number of measures that can be taken on treks/expeditions which fall under the concept of risk management. Depending on the nature of the trip the leader/mountain guide must define what measures are to be taken in order to manage risk both for himself and his clients.

This invariably concerns many different areas of life on expedition. For example some could be measures targeted at hygiene ("Washing hands before every meal.") whilst some might concern technical safety of climbing fixed ropes ("The red rope must only ever be used for ascenders!").

It is very important that everyone understands and accepts these control measures and recognizes their importance to managing the overall risk of the trek/expedition.

The more practical experience a leader/mountain guide has the more likely they are to be able to implement a well thought through and practical risk management strategy. Inexperienced leaders/mountain guides are best advised to seek help and guidance from their more experienced colleagues.

It has to be made clear at the start of a trek/expedition to all clients that even with the best risk management strategy in place there is always amount of residual risk. It is impossible for the leader to guarantee 100% safety and it is inadvisable to give this impression to your clients. Of course depending on the challenge that is undertaken the degree of risk will vary. Every individual has to determine their own level of acceptable risk and this is true for both clients and leaders. Ensuring that every



participant takes personal responsibility for this is another aspect of risk management on expeditions.

This fundamental aspect should be discussed openly and honestly as early on as the initial team meetings. The clients must understand, accept and implement certain standards which can then be followed throughout the trek/expedition without any discussion.

3.6 Weather forecasting for expeditions

The weather is another important factor on an expedition which can influence the chances of success or failure in two ways. Firstly weather conditions in the recent past determine the nature of the ground, and hence the technical difficulties and the risk potential. Secondly the weather experienced during the expedition determines how climbing conditions evolve whilst on the mountain and how tough they are (temperature, humidity, precipitation, wind and visibility). In order to be able to make a good assessment of the situation and plan ahead, constant observation of the weather combined with a modern weather forecast are indispensable.

NOTE:

The weather often determines about success and failure.

3.6.1 Modern prediction by weather models

Modern weather forecasting is mainly based on numerical weather models. Some of these models cover the whole earth (so-called "global models"). These models divide the atmosphere into a grid of cells each a few kilometers squared in size and usually work to a six-hour rhythm. The meteorological conditions for all these cells are calculated up to two weeks into the future. This requires immense computing power but generates a forecast for every grid square on the Earth. As the atmosphere is a chaotic system, very small errors in the initial state are amplified and can lead to large errors in the forecast. This effect also limits how far ahead we can predict in any detail.

NOTE:

Modern weather forecasts are possible for any point on the earth.

To estimate the reliability of the forecast it is recommended to look at several different models or to use what are called "Ensemble-Forecasts". An ensemble forecasting system samples the uncertainty inherent in weather prediction to provide more information about possible future weather conditions. Rather than producing a



single forecast, multiple forecasts are produced by making small alterations either to the starting conditions or to the forecast model itself, or both. The spread of the results is a measurement for the reliability of the forecast.

The forecast accuracy is still limited by finite computational power despite the fact that this has increased rapidly in the recent years (as has forecast quality!). There is still considerable progress expected in this area which can only further improve expedition weather forecasting.

Topographically complex terrain such as that found in the high mountains forms an additional challenge for weather models. Regional models have to be embedded into the global ones to take account of these features and that can very quickly bring even the most powerful computer to its limits. As a result there are often no high-resolution models available for a specific valley in a mountainous area. So for a more accurate forecast it is necessary to combine the results of the global weather models with the knowledge of experienced (mountain) meteorologists. Often the actual weather conditions on the mountain do not correspond well with the forecast results of the nearest grid point in models. The shielding effects of surrounding mountains, windward air congestions or leeward foehn effects all necessitate knowing where the nearest grid point is located relative your summit in the weather model. If the mountain range is orientated north-south and your point of interest lies east of the main ridge whilst the nearest meteorological grid point is west of it, then the forecast provided by the model may not correspond with the reality of your point of interest. Graphical representations of model predictions for a particular point (Meteograms) or for an area (Weather maps) are a good first approximation and form the basis for assessments by meteorologists, but they should not be taken literally.

As well as the chaotic nature of the weather and the limitations of computational power, the potential for poor data availability also reduces the quality of weather forecasting models. Current weather information forms the input data from which all weather models calculate future forecasts. In remote areas where expeditions often take place the availability and accuracy of current weather data is often poor.

Although an increase in the use of satellite measurements predicts a future improvement here, an understanding of how weather models deal with data deficiency is an advantage. In this area the expedition participants can contribute to improving the predictive quality by feeding back actual weather conditions to the



consulting meteorologist. This enables the meteorologist to verify their predictions and learn more quickly about how best to interpret the model for the expedition location. This can only lead to more accurate forecasts. Some meteorological knowledge will help the leader/mountain guide feedback quality information to the consulting meteorologist. However this knowledge should not give rise to the illusion that observations and measurements taken on expedition (such as changes in the air pressure) can result in a better forecast than an interpretation of the weather model by a professional meteorologist at 'home'. Those days are over, and modern weather models are more reliable than any other form of prediction (for the next few days) and have a very high success rate!

NOTE:

Numerical weather models are already very well, but never exactly reflect "reality."

The air pressure, temperature and wind speed, all of which are important for the expedition can be predicted quite well for the free air mass (unaffected

NOTE:

Our own observations of the weather cannot replace a professional weather forecast.

by the ground.) The weather on exposed summits is generally easier to predict than for shielded areas. It is more difficult to predict the humidity and therefore cloud cover and related visibility. The hardest variable of all to predict is precipitation. Nevertheless a rough estimate combined with an indication of the trend ("increasing or decreasing?") is almost always possible. Together with the help of satellite images the current conditions can be compared with the model and this in turn allows an estimation of any inaccuracies.

3.6.2 Weather forecast options available

The most widely used global model is the American GFS model. The data is freely available and displayed on various internet sites in the form of weather maps (www.wetterzentrale.de). These weather maps are normally lacking the fine detail required for expedition areas in order to make meaningful predictions. However for someone with the necessary skills to interpret them they do at least give a general overview. On the website www.meteoexploration.com you can find Meteograms which are updated daily for the nearest GFS grid points to major summits around the world. These are generally easier to understand by non-meteorologists than weather maps, but you must always question (as explained above) whether they actually represent the true conditions for the summit. (In particular the precipitation values



are often inaccurate.) Basic help for understanding the information is often available on the websites. Aside from this, literature on mountain meteorology and interesting learning aids found on www.meted.ucar.edu are recommended (English only). Commercial providers of expedition weather reports have the necessary meteorological knowledge and can interpret the weather maps and diagrams on behalf of the expedition members.

The Swiss company Meteotest (www.meteotest.ch or www.expeditionweather.com) uses the GFS model and can create high-resolution regional weather forecasts with the WRF model. The ZAMG Weather Service in Innsbruck (Austria www.zamg.ac.at) offers a similar service, where meteorologists with high alpine qualifications and experience (some are mountain guides) can advise the expedition. In addition the ZAMG has access to a commercial model called the European ECMWF. This provides a higher accuracy rate in remote areas than the GFS model. Outside the German-speaking areas there are other providers of weather advice for expeditions. In order to get the current weather information and recommendations to the expedition a satellite link is usually required. This allows SMS, fax or e-mails (including meteograms and weather maps if desired) to be received.

Beyond this, of course there is the possibility of engaging a personal weather consultant. This allows the expedition to call for information and advice at pre-arranged times. This option is not only the most complex and usually the most expensive but it undeniably produces the highest quality forecasts. Information and feedback from all participants on the expedition can be addressed accordingly. Satellite communications and numerical weather models have improved the transfer of information and quality of weather forecasting significantly for remote areas of the world. The chances of a successful and safe expedition have grown significantly as a result. It is down to both leaders and clients to take full advantage of these opportunities.

NOTE:

Consultation by telephone is the highest quality-form of prognosis, because feedback from the expedition can be addressed.



3.6.3 Weather Knowledge for Expedition participants

Weather observation on expedition have become less important now that global weather models provide better forecasts and satellite communications allow them to be relayed easily to the expeditions. Despite this it is worthwhile having an understanding of weather fundamentals for expeditions to high altitude. Climbing high mountains around the world is theoretically possible at any time of the year. You just have to be in the right place at the right time.

NOTE:

Consider climatology for the expedition area during the planning stage.

It is certainly true that in the mountains there are often dramatic differences in weather and climate over relatively short distances. So it is important not only to have a general overview of the weather but also to keep as accurately informed as possible. Past reports from previous (even historical) expeditions in your chosen mountain region can prove very helpful. Often these historical expeditions had a scientific aspect to them and gathered all kinds of interesting facts concerning the weather and climate. The Internet can also offer an almost inexhaustible source of information, some of which might prove useful.

The Himalayas is strongly influenced by the Indian monsoon. This displaces the jet stream (a strong layer of wind at about 9000 meters in altitude) to the north during the summer months and brings a lot of moisture and precipitation from the south to the mountains. The Karakorum is affected by the Indian monsoon but the westerly winds of the middle latitudes also have a big influence here. Therefore it is necessary to keep an eye on low pressure and frontal systems.

The Pamir, Tianshan and Altai lie outside of the control of the Indian monsoon and are characterised by a very continental climate. This means that it is relatively dry (in some regions almost desert-like) and bitterly cold in the winter months and cool during the short summer. However there are also some very rainy areas, like in the Kyrgyz Tianshan Mountains.

In Tropical mountain regions (e.g. the Peruvian Andes or Kilimanjaro) there are no four seasons and - if any - only weak monsoon winds to deal with. Here, the year is much more marked by the change between one or two dry and wet seasons. The daily temperature variation year round remains constant for a given elevation and only the humidity and precipitation are subject to an annual cycle. There are low pressure areas with frontal systems and strong winds at times in the Tropics but of



more usual occurrence are locally generated convective cells leading to heavy rainfall (thunder storms) and poor visibility.

In the Moderate, Cold temperate climates (Siberia, Alaska, Patagonia) climbers should focus their attention on low pressure systems. These bring the most precipitation and the associated cold fronts can bring particularly hazardous weather changes and extreme cold (due to the proximity to the Polar Regions). Convection cells and thunderstorms play a far less important role in these regions.

Further north and south, in the Arctic and Antarctic, there is only one expedition season. This is because it is either completely dark or too short of daylight during the remaining time. The accessibility of these areas places a considerable restriction on when expeditions can take place. By far the biggest problem in these areas is the extreme cold. Nevertheless even in the Arctic and Antarctic there is a change between stable/sunny weather and stormy phases. The large ice sheets and massive glaciers have a noticeable effect on local weather in terms of the wind. Because of their sheer size they can generate very high winds known as katabatic winds. Snow drifts and "White-Outs" are the unpleasant consequences of such winds. The weather forecast for the Polar Regions can be rather imprecise. Partly because there are few measurements and partly due to the fact that geostationary weather satellites do not cover these areas.

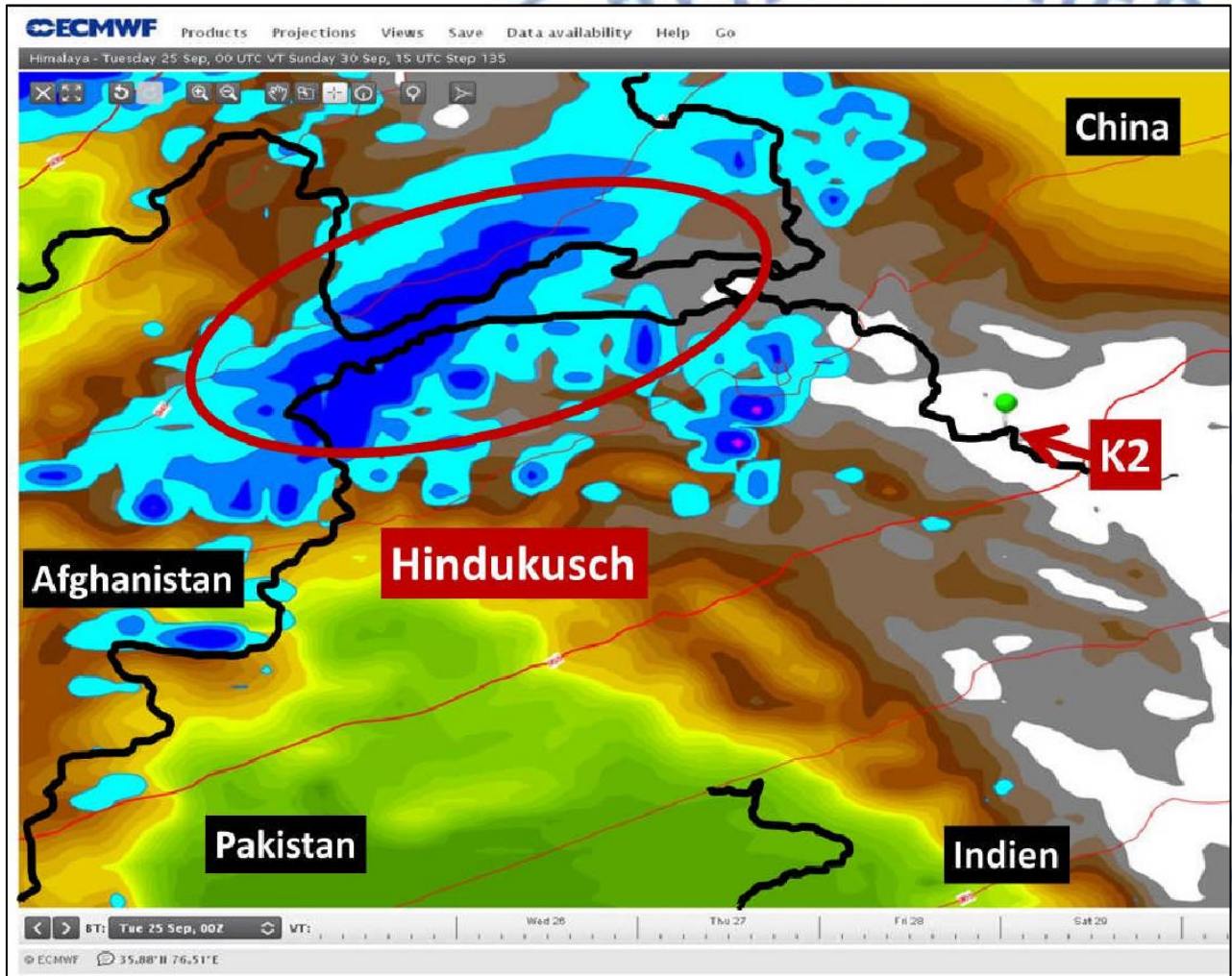


FIG 1:

Forecast for Tuesday through to Sunday:

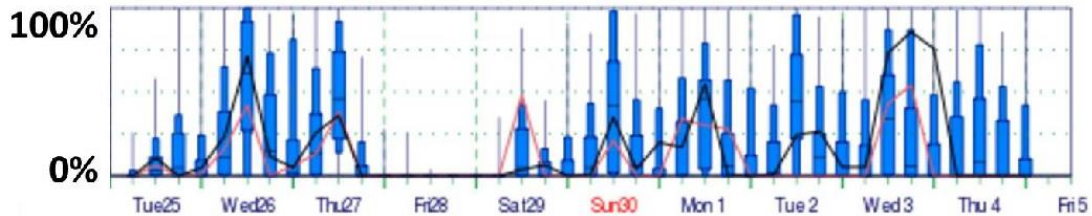
A cold front will cross the Hindu Kush. Intense rainfall is expected, which is shown on the weather map by blue (the darker the colour, the more intense the precipitation). The black lines correspond to state borders. The red lines show (barely visible) the high pressure area. In the background the colours green through brown and up to white show “modeled geography”. Green corresponds to the lowlands, brown the higher altitudes and white indicates terrain above 5000 meter. The green pin and red arrow mark K2 on the border between China and Pakistan. In modeled geography the high, prominent mountains are not pinpointed. In this or similar ways weather maps can represent any point on the earth. Besides precipitation other variables such as the temperature or the wind can also be represented. (Source: ECMWF WREP)

EPS Meteogramm für den K2

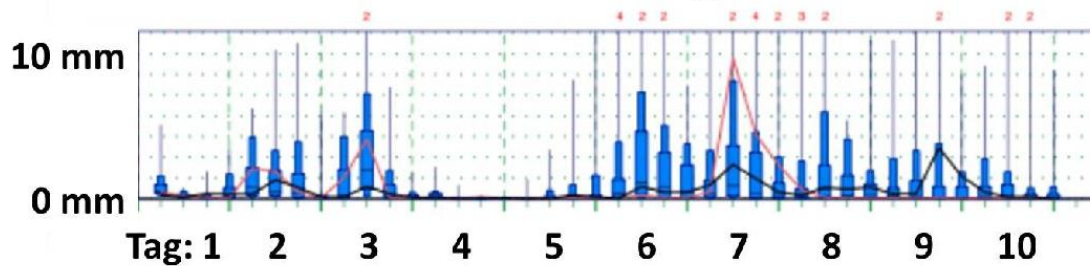
Location: 35.88'N 76.51'E

[+ More ...](#) [+ Load](#)

Wolkenbedeckung



Niederschlag



Matched to Figure 1 is this 10-day EPS-Meteogram for K2.

The chart above shows the predicted amounts of cloud cover. Below are the predicted levels of precipitation for each 6 hours period.

These are called "ensemble forecasts" (EPS). The length of the blue bar gives an indication of the possible range of fluctuation / the uncertainty of the prediction. For example on day 2 everything is possible between "clear" and "covered" but on day 4 it is most likely to be clear because there are no blue bars in the upper diagram. From day 5 another cloudy phase will start and the lower diagram tells us that there may even be precipitation.

The cold front mentioned in Figure 1 probably passes K2 on days 6 and 7. You can see this because on both these days the cloud cover and precipitation increase, (indicated by long blue bars). (Source: ECMWF WREP)



3.6.4 High altitude climate and human energy balance

The energy balance of a person is directly affected by the meteorological conditions of their environment. During a mountaineering expedition it is important to be aware of this fact because the human body will need to use a huge amount of energy to maintain its life functions aside from that required for any physical activity. The four most important parameters in this context are addressed below.

1) Lower air pressure – Reduction in available oxygen.

The atmospheric pressure decreases with altitude and with it the partial pressure of oxygen. The atmospheric pressure at sea level is about 1000 hPa whilst at 5500m it is approximately 500hPa (in mid-latitudes). At 5500m a climber therefore only has half as much oxygen available per breath than at sea level. At 8000m in the Himalayas the air pressure falls to around 350hPa. Here the oxygen available is a third of the value of sea level.

It should be noted that air pressure at altitude also depends on the latitude. The atmosphere is thicker near the equator than it is at the poles so the air pressure (and hence partial pressure of oxygen) on the summit of Kilimanjaro at around 6000 meters is about the same as that on the summit of Denali at 5000 meters (about 500mb). This effectively means that a 6000 meter mountain in the tropics is physiologically comparable with a 5000 meter mountain at higher latitudes. (This fact can also be observed whilst navigating using altimeters)

2) Cold.

Air temperature also decreases with altitude and the rate at which it does so is called the Lapse rate. If the air is unsaturated (before it reaches the dew point) the decrease is almost the same rate everywhere which is 1°C/100m. When clouds have formed (the air has reached the dew point) the decrease is about 0.65 °C/100m.

It is therefore naturally colder at higher elevations than at lower ones. The temperature level in the Tropics is generally higher than at the poles so it follows that milder temperatures prevail in the mountains there as well. At 5000m in the Tropics daytime temperatures can be around freezing point, whilst in the Polar Regions this



can vary between extremes of -10°C in summer and -50°C during the polar night.

3) Dehydration

Air almost always contains a certain amount of invisible water vapour although at very cold temperatures this can be very little. Air is exhaled almost at body temperature and saturated with water vapour. This means that with every breath water is lost from the body to the atmosphere. At 5000m the loss is about 15 mg per litre of breath which over the course of a days' effort can add up to several litres of water. This is why so much additional water has to be taken on board at high altitudes to keep the body working efficiently.

4) Wind chill

Clothes keep you warm by reducing heat lost through thermal radiation from the body. They ensure that an insulated, warm air layer surrounds the body and protects it from the cold external environment. This layer prevents heat exchange between the body and the surrounding air. This protection can be reduced significantly by the effects of massive wind. Wind can cause the air inside the clothes to be continuously exchanged and the body then has to constantly expend energy to rewarm this air layer. Strong winds are often encountered at high elevations and special attention must be paid to windproof clothing. Mountaineers should always consider the combination of temperature and wind to assess the "Wind chill". Wind also increases direct evaporation or sublimation from wet or icy clothes. These processes cool you down very rapidly and cost the body a great deal of energy. Therefore adequate dry clothing is essential.



Weather links

On expedition you have to rely on precise weather forecasts and information. We recommend for bigger trips to book a personal forecasting with one of the worldwide services.

Using modern communication devices (Satphone, Inreach, Bgan, etc.) a good forecasting information data is today's standard.

In many areas we cannot expect a forecast in the same quality as we are used to i.e. in the Alps. Therefore extended knowledge of forecast models and their interpretation is necessary.

Useful links:

www.usno.navy.mil/FNMOC

<http://ready.arl.noaa.gov/READYcmet.php>

https://www.fnmoc.navy.mil/wxmap_cgi/cgi-bin/wxmap_DOD_area.cgi?area=np_samer

<http://www.wetterzentrale.de/topkarten/fsavnsam.html>

<http://www.ecmwf.int/products/forecasts/d/charts>

<http://expeditionweather.info>

<http://www.meteoblue.com>

<http://www.zamg.ac.at/cms/de/produkte/wetter/spezialprognosen/expeditionswetter>

<https://www.windy.com>

<https://www.yr.no>



3.7 Emergency

3.7.1 "P.R.O.O.D.E.C" - Emergency management

To achieve quick and effective decisions in emergency situations it can be very helpful to use a protocol like "PROODEC". This system was produced for Mountaineering by the pilot H.P. Hartmann, who published it in the magazine *Bergundsteigen* in 2002 (vol. 2/02).

This protocol can help us make good decisions in stressful situations. Using this system all group members are involved in the decision making process. The decisions are based on arguments which are clear and comprehensible to everyone. The leader/mountain guide who has more expertise and responsibility should always be the one who makes the final decision.

1. **P**roblem... define it!

Examples:

"... we're lost! "

"... we cannot realistically reach base camp anymore! "

"... we have encountered unexpectedly difficult terrain! "

2. **R**esources... what can we use to help us?

Examples:

"... we could take a break, discuss the problem and hopefully uncover new insights or at least buy some time... "

"... we could call for help from BC by radio. "

3. **O**ptions... what paths are available to us?

Examples:

"... could we use the GPS to get any further?"

"... could a part of the group get help? "

"... could we create an emergency bivouac and make it as good as possible? "

"... could we continue a little more cautiously despite increasing difficulties?"



4. **O**ptions... how attractive are these paths? Evaluate them!

The advantages and disadvantages are discussed with the whole group and the best one is selected.

5. **D**ecision

Examples:

"... Considering the options available a bivouac is the safest one! "

"...This is what we are going to do next..."

"...You are going to do this..."

6. **E**xecution

The Leader allocates tasks and gives clear instructions in the execution of the decision. For example whilst constructing the bivouac the Leader could task some of the "more robust" clients with digging whilst the "weaker" clients conserve their strength.

7. **C**ontrol

Controlling the result is essential; because you have to make sure that the actions were effective and are likely to be successful. If the actions are not successful then you must start again by defining the problem anew.

Under no circumstances should the impression be given that emergencies can be solved by long discussions. However it must be recognised that great effort is wasted if the effort is in the wrong direction. The PRODEC system gives a practical, quick, objective and disciplined approach to something which the expedition leader/mountain guide has ultimate/final responsibility for.

3.7.2 Survival in ice and snow

"Despite appalling conditions and by extreme fortitude, determination and superhuman strength they successfully endured the nights' bivouac..." - this is the stuff of mountaineering legend. Few mountaineers have not heard the story of the first ascent of Nanga Parbat in 1953 when Hermann Buhl spent the night standing alone at nearly 8000m. Most experienced climbers can recall their own somewhat less dramatic story of an unplanned night under the stars. However, whilst professional mountaineers might survive a bivouac with the odd "blue toe or two" (Hermann Buhl lost two toes), a winter bivouac for a less experienced climber can be life-threatening. Despite satellite phones and helicopter rescues to almost 6,000 meters every year there are many accidents involving spectacular rescue operations that do not end well.

3.7.2.1 Types of Snow shelters

There are basically two types of snow shelters that can be constructed. There are snow holes and igloos. Without going into detail about all the different variants two basic types will be explained: the Snow Trench and the Snowmound or "Quinzhee" which is possible to construct in virtually all conditions.

The classic "Brick-build Inuit igloo" is not usually used as an emergency bivouac because it requires good snow conditions and a lot of expertise to build. To live in the snow for several days (for expeditions to regions with severe storms and a lot of snow) it would be advisable to dig a more comfortable snow cave. On glaciers you have the additional option of bivouacking in a suitable crevasse. This should never be done without ensuring an adequate self-belay and that the crevasse is clearly marked from above.

The preferred type of snow shelter will depend on the external conditions and circumstances. The decision will have to be made on the spot. What is most important is that you do not just sit down where you are but that you dig yourself in somewhere to protect yourself from the combined effects of the wind and low temperatures.

3.7.2.2 Time required

With the right equipment (shovels, ice axes etc...) it should take four people (depending on the circumstances) about 30 minutes to dig a trench bivouac. A Snowmound or “Quinzhee” can be created for four people in less than an hour. If you want to dig a comfortable snow cave you should count on needing about 2-3 hours. In poor conditions this time can easily double.

3.7.2.3 Choosing the Bivouac site

When choosing a suitable location you should be very choosy (This is not always easy when you are in an emergency situation). Not all places are equally suited to siting a bivouac. Objective safety should not be neglected (avalanches, falling ice, dangerous crevasses etc.) Contrary to the widely held idea that wind-scoops, cornices or leeward faces are well suited for bivouacking you are better advised to select a site with calmer wind conditions and good amount of snow. Constant drifting snow as a result of the wind can quickly cover the entrance and result in a lack of oxygen in the snow-hole. A supply of sufficient fresh air is essential, especially if you cook in the bivouac!

The snow depth should be at least 120 cm and the snow ideally a little compact. If possible, the entrance area should be well protected from the wind. If you dig a bivouac on a slope, you can save yourself a lot of shovelling work because the excavated snow rolls down the slope away from the entrance of its own accord. Inside the snow-hole a cold “air sink” can form where the heavier cold air sinks downward.

3.7.2.4 Construction strategy

Despite cold temperatures and stress it is important to dig furiously to get out of the wind as quickly as possible. With this sort of effort, you are going to sweat a great deal and of course, afterwards you will cool down very quickly. It is a good idea to take some layers off, particularly if you have no dry clothes left in your backpack. This will ensure that you have something dry to wear in the bivouac later on. Lightweight plastic shovel blades can easily be broken so although it has to be dug fast... dig carefully!

3.7.2.5 Snow Trench Bivouac

The simplest and fastest emergency bivouac can be created by digging a trench vertically downwards with about a 1m² surface area per person. Over the trench skis or poles can be placed and then everything can be covered by a bivy bag. The bivy bag can then be loaded with snow over the top so that it cannot be blown away by the wind. This also creates an insulating layer.

3.7.2.6 Snowmounds or “Quinzhee”

Snowmounds (also known as quinzhees) are among the easiest shelters to build. All you need is enough surface snow to shovel into a big pile over rucksacks or equipment. The tunnel entrance is then dug and the gear removed. The shelter can then be hollowed out and enlarged.

First you must flatten down a circular patch of ground and then pile all rucksacks and equipment onto it before covering the pile with a bivy bag. Standing well away from the equipment pile you shovel snow into the centre and bury the rucksacks. To increase the mounds strength pat down the snow as you proceed. The buried equipment must have a minimum of half a meter of consolidated snow covering it. Probe all around the mound with an ice axe or ski pole and shovel snow on any thin spots. You can then dig into the mound on the downhill side or away from the wind to form an entrance. Dig down first and then back up into the shelter to create a cold air sump. The rucksacks and equipment can be pulled out and the resulting ‘primary cave’ makes it easier to hollow out the rest of the mound.

BEWARE: When hollowing out the mound do not dig too close to the surface otherwise the mound may collapse. When you begin to see blue light the walls are thin enough and this will be about 30cm thick.

3.7.2.7 Emergency Snow hole

With a "classic" snow hole you start by digging a narrow entrance tunnel that should be angled slightly upwards into the main body of the cave itself. Once this is dug the work can start on the actual cave. The ground level of the cave should be higher than the entrance so that cold air can sink outwards. To provide good ventilation (vital to avoid suffocation) you must have air access to the surface. The entrance

can be closed with large blocks of snow. The floor of the snow cave can be covered by bivy bags to avoid getting wet from the snow. Whilst digging the cave itself people should take turns and work as a team. One person can be enlarging the cave whilst another shovels the excavated snow away from the entrance. For emergency purposes the snow hole should not be so large that you can lie or stand in it. It is sufficient to have enough space so that you can sit comfortably without touching the snow walls. Sitting in a crouched position on backpacks will help you lose less heat.

3.7.2.8 Mark the bivouac

If the team knows your plan and everyone sticks to it, it is reasonable to presume that the rest of the team will endeavour to find you as soon as practically possible. Therefore, it is essential that you mark your bivouac site very clearly so that it can be seen from some distance. Marking the location with GPS, flags or even avalanche transceivers is standard in expeditions.

3.6.2.9 Behaviour in the bivouac

Anything with insulating properties should be used as a base to sit on. Wet clothing should be changed for dry (spare fleece/jackets). If possible, you should loosen mountaineering boots because any pressure point that constricts blood flow can lead to frostbite. Getting two people to share a bivy bag is an excellent way to conserve body heat. Don't forget to use the emergency silver foil rescue blanket in the first-aid kit. This can be wrapped underneath the bivy bag and around the body. Another helpful item is a candle. It not only acts as a light and heat source but also strengthens the morale of the team in an incredible way. An emergency bivouac can be an extremely stressful situation and precisely because of this you must never become despondent. This is of particular importance for the leader/mountain guide. You must strive to stay active and pass the time with encouraging and upbeat stories. If you keep the conversation going it highlights early on if a member of the group is getting worse and allows something to be done about it immediately (Put that person in the middle of the group or give them a "hot rub"). As heat loss increases it is important to keep your arms and legs moving constantly although this can be extremely difficult in a small space. Local problem area such as the nose, ears, cheeks, fingers and toes can be massaged in order to prevent cold damage.

3.7.3 Hypothermia

In the emergency bivouac hypothermia is by far the biggest danger faced by a climber. As a result of a combination of factors (cold temperatures, wind, wet clothing, inactivity) the body temperature can be reduced by about 1 – 3 °C per hour. Normal body temperature is about 37 °C and a fall below 30 °C can prove life threatening. Guidelines for external indications of body temperature are:

35 ° - 32 ° C: shivering, agitation, rapid pulse, pale or blue skin colour.

32 ° - 28 ° C: drowsiness, shallow/slow breathing, slow pulse.

below 28 ° C: unconsciousness, weak/slow pulse, continuing to respiratory and circulatory arrest.

The onset of hypothermia is often accelerated by the wind or the wind chill effect. The combination of cold air temperature with wind speed can result in massive cooling of the skin surface and subsequently cooling of the entire body. At temperatures below -25 ° C uncovered skin will become frostbitten in a very short time. At temperatures below -40 ° C this can take only a few minutes!

In a snow cave (described above) you will be protected from extremely low temperatures and more importantly from the wind. This significantly increases the chance of survival compared to an open bivouac.

3.7.4 Exhaustion

In addition to the external factors (wind and temperature), pure physical exhaustion also plays a significant role in the onset of hypothermia. If the body is too exhausted to generate heat through shivering then the body temperature will drop even more quickly and the cooling process will accelerate. Therefore it is strongly advised not to carry on searching for a solution to a desperate situation to a point where reserves of energy have been seriously depleted. Better to take positive action before this point is reached so that some reserves remain which will give stronger chances of survival.



4. After the trip

4.1 Environmentally-friendly Travel

As awareness increases of the environmental impact that adventure travel can have on remote regions we must consider this important aspect. Only by actively involving local people and setting a positive example with our own interaction with nature and resources that we can contribute to a healthy and sustainable tourism industry. Staff from the local area should be used whenever possible rather than bringing in external personnel. For example using Nepalese porters in other destinations. Work as a porter, cook or leader forms an important part of the local economy and generates long-term development towards meeting current travel industry needs. The native workers also form a good link with the region and allow the group the possibility of gaining further insights into the life and culture of the destination country.

In many mountainous countries increased deforestation and logging is causing irreparable damage through soil erosion. As the tourism industry grows, more and more forested areas are being severely affected. Although it is customary that the kitchen staff cook with gas or kerosene you must also think about providing for your porters. They too must be provided with good cooking equipment so that they are not forced to find and use scarce resources in often fragile regions.

It is one of the many tasks of the leader/mountain guide to control the correct disposal of the rubbish from the expedition. In some places, the waste management is not to the standards of more developed countries. Very often, waste is disposed of in poorly maintained or located landfills and dumpsites. Reducing the amount of waste produced during an expedition/trip should be beneficial for the porters and also for the sustainability of the local environment. The mountain guides and their clients not only have a personal responsibility but can also play a crucial role in encouraging local agencies to give priority to such issues. Raising awareness and hand on solutions should be also suggested by the mountain leaders. Hazardous or problem-materials must be taken back home. It is not right to give this responsibility to the



local staff. The collection, disposal and return transportation of rubbish requires some consideration and careful planning well in advance of the trip. It should be given the same level of importance and attention as the other aspects of the journey. Suitable containers (drums, strong garbage bags, etc.) are necessary items on all trips. The use of any local disposal sites together with any rules and regulations must be considered and adhered to during the trip. Before the trip, a briefing on the social and environmental situation of the country should be considered, including waste management or carbon footprint. A debriefing should be considered at the end of each trip to assess the measures put in place and possible improvements.



Appendix

1. IFMGA Guidelines

2. Case studies:

- A) Mt Everest (Victor Saunders)
- B) Cho Oyu (Josef Simunek)
- C) Kilimanjaro (Herbert Mayerhofer)
- D) Glacier traverse (Jean Annequin)
- E) Ama Dablam (Chris Semmel)
- F) Alpine Style (Terry Ralphs)
- G) Active Volcanoes (Bianchi et al.)
- H) Svalbard (Sigmund Andersen)

3. References

4. Further Reading, Links, Memos, Examples

5. Authors

6. TrexCheck template



1. IFMGA Guidelines

HIGH ALTITUDE EXPEDITION and TREKKING GUIDELINES

1. Introduction

These Guidelines have been drawn up by the High Altitude Guiding Sub-Commission of the IFMGA's Technical Committee, and cover the role of IFMGA members in guiding on trekking and expeditions. It provides definitions of the various types of expeditions which are commonly practised, and identifies the main issues confronting the high-altitude mountain guide.

Although these Guidelines are intended for use by IFMGA members, they are recommended to all professional trekking and expedition organisers, whether or not the trekkings and expeditions include IFMGA leaders and guides.

These Guidelines cover the following aspects of professional treks and expeditions:

Categories of professional treks and expeditions, including the role of the guide.

The guide's experience.

The use of the IFMGA logo.

Client experience.

High Altitude Warning.

Communications.

Medical.

Environmental.

Training.

Rescue ethics.

Throughout these Guidelines, professionally organised expeditions are referred to as "Professional" rather than "Commercial" expeditions. Although the latter term is more commonly used, it has become associated with poor practice and commercialisation, a stigma which is not appropriate for well-run treks and expeditions.



2. Categories of Professional Expedition

There are 4 categories of IFMGA high-altitude expeditions. These are determined by the role of the guide and the level of service provided. An important thing is also the level of support given by the guide/tour operator (fixed ropes, alpine style climbing, etc.)

The "IFMGA Expedition Scale" is as follows:

2.1 Individually Guided Expeditions

This describes guiding in the classic sense with the guide working with his/her clients at all times. The usual procedures of Alpine guiding will be applied in a Himalayan environment. This would necessitate a 1:1 or 1:2 guiding ratio in most cases. Individual guiding can be included in any of the following categories of expeditions. The qualification of the client is at the responsibility of the guide concerned.

2.2 Guided Expeditions

This is the term applied to the more usual climbing strategy on high altitude expeditions. However, it was felt necessary to apply the following criteria, which would need to be met in order to fulfil the term "guided".

- a) The guide should place or prove all fixed ropes and site all camps. The guide should check rope fixings and other aspects of security on the mountain.
- b) The guide should endeavour to go to the top with the clients. This is to provide a clear distinction from led or consulted expeditions, although it is recognised that experienced clients may sometimes go to the summit outside of the direct supervision of a guide.
- c) The maximum guiding ratio is to be 1 guide to 4 clients.
- d) The leader must be IFMGA. It was agreed that other guides working on the expedition could be competent local guides such as Sherpas, who have a working knowledge of English or the predominant language of the expedition members. However, these were to be recruited as guides and not as porters who would double up as a guide, and they must have previous high altitude mountaineering experience suitable for the mountain being undertaken.

2.3 Led Expeditions

IFMGA Led expeditions are where the expedition is organised up to and including base camp (or advance base camp if one is usually used). The limited services provided would include the following:

- a) The presence of an IFMGA guide at base camp or advance base camp.
- b) Sherpas or local high altitude porters to place all camps and fix ropes as instructed by the IFMGA guide.
- c) All services up to and including base camp and/or advance base camp to be included.

The purpose of Professionally Led expeditions is to give experienced climbers the chance to climb a high peak. In theory, such "clients" do not need to be guided and they would accept that no guiding as such would take place on the mountain. The guide would have no responsibility above base camp for the safety of "the clients", but the guide would be there to give advice, direction and possibly training to the climbing team. The guide may or may not go on the climb him/herself, but the guide should be in radio contact with the team members at all times.

2.4 IFMGA Logistically Supported Expeditions.



IFMGA Logistically supported expeditions are where the expedition is organised up to and including base camp (or advance base camp if one is usually used). These would be operated on a similar basis to the "Led" expeditions with the important exclusion of any services above base camp, as follows:

- a) The presence of an IFMGA guide at base camp or advance base camp is not necessary.
- b) All services up to and including base camp / advance base camp to be included.

Logistically Supported Expeditions are intended for private teams who wish to have the convenience of having the expedition organised by a professional operator. However, they would be completely self-sufficient on the mountain, providing all their own equipment and food, unless arranged for separately by the expedition operator.

2.5 IFMGA Trekking.

In general it can be presumed that all the above categories are applicable. However, an IFMGA guide should be responsible for the correct level of qualification of trek leaders. Care should be taken to have an appropriate guiding ratio and group size according to the trek being undertaken.

3. Expedition Leader's Experience

The minimum level of experience for the IFMGA leader in each of the above categories of high altitude expedition should be as follows:

3.1 Individually Guided

Leaders working on an individually guided expedition should have been on a similar expedition before, preferably as a guide.

3.2 Guided Expeditions

Leaders working on a guided expedition should have been on a similar expedition before, preferably as a guide.

3.3 Led Expeditions

For Everest and peaks higher than 8,200m the leader should have at least been to 8,000m before. For the lower 8,000m peaks (up to 8,200m) and below the leader should have been to similar environments before preferably as a guide.

3.4 Logistically Supported Expeditions

The consultant of the expedition should have a solid knowledge of expedition logistics.

3.5 Trekking

The guide should have at least the minimum level of qualification necessary according to the trek being undertaken. He should ideally have been to the same altitude reached on the trek several times before, preferably as a guide. A good knowledge of the country and trek conditions is a must.



4. The Use of the IFMGA Logo

Teams which fulfil the above minimum IFMGA representation appropriate for their category of expedition will be able to:

- a) Call their expedition an IFMGA Individually Guided / Guided / Led / Logistically Supported expedition / Trek.
- b) Use the IFMGA logo on advertising about the expedition.

Teams which do not fulfil the minimum IFMGA representation for their category of expedition will not be able to use the IFMGA logo in any way.

5. Client Experience

Expectations of the clients might vary a lot, depending on the information provided by the guide and also out of the different cultural backgrounds of the clients. These should be taken into consideration when being in contact in the booking phase.

EXPEDITION

The client must truthfully reveal, by means of a questionnaire or other written notification, their mountaineering experience and relevant medical history, to enable the expedition organiser or leader to make an informed decision on the suitability of the client for their chosen objective. When deciding on the suitability of a client the expedition organiser or leader should consider their high altitude experience, technical ability, physical and mental toughness, fitness and group compatibility. The selection of the client for any expedition is at the discretion of the leader or organiser.

TREKKING

The selection of the client for any expedition is at the discretion of the leader or organiser.

6. High Altitude Warning

It is the responsibility of each expedition organiser to issue a High Altitude Warning to all clients and to make it clear that there are additional dangers, such as altitude sickness and cold injury. Clients must be made aware of the hazards of high altitude climbing and trekking, especially above 8000m where they will be at the limit of their mental and physical abilities. Also, the ability of the guides to assist the client may be reduced.

7. Client Information

Expedition and trekking organisers should provide the following information to the clients before commencement of the expedition or trek:

- a) The type of expedition i.e. whether it is an Individually Guided / Guided / Led / Logistically Supported / expedition or trek.
- b) The level of service provided including guiding ratio.
- c) Biographical details of the guides.
- d) Route description, with details of technical difficulty, objective dangers and security provided.
- e) Past experience of the mountain and likelihood of success.
- f) Insurance arrangements.



- g) Medical and casualty evacuation arrangements.
- h) Personal equipment list.
- i) Price inclusions and exclusions.

8. Communications

All categories of 8000m expeditions, except only logistically supported ones, should have the following level of communications:

- a) Rear link provided by radio or satellite phone, or access to a satellite phone, for medical and weather forecast purposes.
- b) Walkie-talkie radios from base camp up and at least one walkie-talkie for every camp and/or guide on the mountain.

Trekking and expeditions below 8000m:

It is recommended to follow the same guidelines, but this should be at the discretion of the guide/organiser according to the objective and style of the trip.

9. Medical

The responsibility of the guide is not only to take care of the clients but also of the whole team and staff (sirdar, cook, porters, helpers, driver,...).

On expeditions above 8000m the following medical equipment should be provided:

- a) We recommend a medical practitioner is included in all teams but recognise that this will not always be possible.
- b) The emergency first aid kit should be available in every camp, with a full first aid kit at base camp and/or advance base camp.
- c) There should be a minimum amount of oxygen available
- d) A portable hyperbaric chamber must be available as part of the medical equipment.
- e) Advance arrangements must be made for evacuation assistance in the case of emergency.

On trekkings and expedition below 8000m the following medical equipment should be provided:

- a) A suitable first aid kit.
- b) It is recommended to bring a hyperbaric chamber. But it is up to the discretion of the IFMGA guide/organiser to adapt the equipment to the style and objective undertaken
- c) Advance arrangements must be made for evacuation assistance in the case of emergency.



10. Environmental Practice

This is an important issue which draws a lot of media attention. Abandoned equipment and garbage on mountains and at base camps is an eyesore and professional expedition organisers have been an easy target to blame. The reality is that most professional operators are highly responsible in their attitude towards mountain pollution, thanks to an increasing awareness of these issues among both, guides and clients. However, it is still necessary to lay down a Code of Practice, the basic theme of which is outlined below. It is recognised that several very useful and detailed codes of practice already exist which should be embraced by IFMGA expeditions, such as the UIAA Ethical Code for Expeditions, the Kathmandu Declaration and the BMC Mountain Tourism Guidelines.

10.1 Human Waste

Avoid unsightly sanitation on the mountain. At base camp (and advance base camp where applicable). A barrel should be used for a toilet which is transported to a suitable disposable point after the expedition. On the mountain, other alternatives than plastic bags, wet wipes, and non-biodegradable cleaning products should be used, which can be disposed away from water sources. Alternatively, it can be removed from the mountain altogether.

10.2 General Garbage

Garbage should be taken to a place where it can be disposed of off the mountain and in an environmentally friendly way. Rubbish should only be burnt if it is not offensive to local religious beliefs (as in the case of Sherpas in Nepal and Tibet) and that the remaining ashes don't pollute the environment (i.e. they can be properly buried)

Used batteries should be re-exported back to the country of origin.

10.3 Equipment

Every effort should be made to retrieve ropes and used oxygen bottles from the mountain. Teams should encourage high altitude porters to retrieve such items for either their use or for recycling.

10.4 Wood

Under no circumstances should wood be cut by the expedition members or by local staff and porters employed by the expedition. Enough kerosene or other fuel should be provided for all cooking, including for porters. When lodges are used on the trek in and out from base camp, it is encouraged that all cooking should be done by using kerosene, dung or other fuel, other than the wood burning stoves of the lodge.

11. Local Guides' Training

The need to train local guides such as Sherpas should be a priority for IFMGA guides who work on expeditions. Opportunities may exist for such training to be provided in tandem with experiential training for IFMGA guides, and these are being investigated by the IFMGA HA Expeditions Sub-Committee.

Training for local guides can be arranged independently by IFMGA expedition leaders and operators, as a responsibility to their staff. As a minimum, IFMGA expeditions should ensure that their local staff who are going above BC/ABC are trained in the use of the following:

- a) The use of fixed ropes.
- b) The use of specialist equipment such as oxygen and radios



Local staff should also be kept informed of matters affecting the expedition and, where appropriate, included in the decision making process where their experience may prove very valuable.

12. Rescue Ethics

IFMGA expeditions should render assistance to other expedition team members who are in a life threatening situation on the mountain, so long as this does not unreasonably compromise the safety of their own team members. Clients need to be made aware of this possibility at the start of the expedition, and that any rescue effort may jeopardise their summit chances.

13. Local staff

It is the responsibility of the expedition leader to ensure the safety of the local support staff (sherpas, porters, cooks etc). The local support staff must be adequately equipped for their tasks.



2. Case studies:

- A) Mt. Everest (Victor Saunders)
- B) Cho Oyu (Josef Simunek)
- C) Kilimanjaro (Herbert Mayerhofer)
- D) Glacier traverse (Jean Annequin)
- E) Ama Dablam (Chris Semmel)
- F) Alpine Style (Terry Ralphs)
- G) Active Volcanoes (Bianchi et al.)
- H) Svalbard (Sigmund Andersen)

A) Guiding on Everest

Author Victor Saunders

INTRODUCTION

Some guides say that it is not possible to guide clients at very high altitudes. Experience shows that this view is mistaken. However the methods of managing clients on Everest area little different from those we use in the Alps.

I am going to focus on the standard South(Nepalese) side route in this paper, though many of the comments will also apply to the North (Tibetan) side.

TYPICAL TIME LINE ON EVEREST

The average time for an expedition to Everest is 60 days, the teams typically arriving in Kathmandu (the usual starting point for both the North and South side) in late March, reaching the base camp at 5400m in mid April. The teams will normally acclimatize by climbing to higher camps in short cycles, rotations lasting a few days with recuperation periods at base camp. For example the first few days will be spent around base camp, followed by excursions into the Khumbu Icefall (5500 to 5900m).

Some teams avoid repeat trips through the Icefall by climbing nearby 6000m peaks such as Island Peak or Lobuche East; this is highly recommended, as it reduces time spent in the most dangerous part of the lower route. The following cycles will involve sleeping at successively higher camps till a night is spent in Camp 3 (between 7200m and 7300m). For the last two decades the Icefall has been fixed by the Nepalese, the SPCC Icefall team, who charge a fee (USD 300 pp in 2021) to each climber for the service. They maintain the fixed ropes (not always very well!) as the Ice fall alters its shape during the season. Above Camp 2 (6400m) the fixed ropes are fixed by Sherpas from EOA (Expedition Operators Association, the main Nepalese agents working together). The EOA charge a fee for this service which in 2021 was USD 600 pp.. This stage, the acclimatisation stage, is normally complete by the first week of May. The acclimatising stage is often followed by a short period of rest at lower altitudes. (It is an idea that seems to have its origins in the old Soviet mountaineering academies, who advocated a descent to the tree line to improve appetite, sleep and general healing for two or three days.) Many teams prefer to “quarantine” in the base camp, avoiding contact with visitors. It has also become popular to descend by helicopter to Namche or even Kathmandu during this pre-summit attempt rest.



The summit attempt cycle generally takes place in the second half of May, though in some years it can be as late as early June. The teams will aim to spend one night at each camp in ascent. Commercial teams normally use O2 from Camp 3 in order to arrive at Camp 4 by midday, rest and be ready to start the summit climb the same night.





From Camp 4 it is normal for the commercial teams to attach one Sherpa to each client for the summit attempt. This is to ensure that the client need only carry one bottle of O₂, and that the extra bottles are nearby at all times.

The commercial teams will usually collaborate in advance of summit day, and if the weather window is wide enough, will choose alternate dates to avoid overcrowding on the big day. The most common summit days seem to fall between 15 and 25 May. A normal team will take between 7 and 10 hours to reach the summit, with about half that time required for descent to Camp 4 (8000m).

Most teams will spend a second night at Camp 4 (quicker teams will descend to Camp 2). It is normal to provide sufficient bottled oxygen for the team members to sleep on the gas at low flow rates. Most teams will descend in stages, spending a further night at Camp 2 before returning to base camp. It is now not un-common for climbers to descend from C2 by helicopter. The expeditions will trek out to Lukla in three days (Many prefer to helicopter out from base camp) arriving in Kathmandu in late May. So, the time period is essentially all April and May, with a little bit of March. The time spend at or above base camp is typically 45 days.

SHERPAS

The use of Sherpas on Everest permits the fixing of ropes and use of bottled oxygen. Thus it is the presence of Sherpas that historically made Everest safer than K2, though that is changing now.

The fatality rate for climbers above base camp up to 2006 was 1.3% in the 45 days. This is about the same as the mortality rate for a 61 year old man over a year. (He has a 1.3% chance of not reaching his 62nd birthday). Most (83%) of non-Sherpa fatalities occurred above 8000m. It is worth noting that the fatality rate for non-Sherpa climbers returning from the summit up to 2006 was 2.5%. The number of Sherpas reaching the top in the same period was about equal to that of non-Sherpas, but the fatality rate for Sherpas was much lower at 0.2%.

The current arrangement of attaching individual Sherpas to clients for summit day appears to drastically reduce the fatality rate, at least for commercial expeditions, although the last decade has seen the local Nepalese companies taking increasingly larger numbers of clients to Everest, sometimes with very high guide to client ratios and often without the 1:1 summit day ratio.

FIXED ROPES

It is the use of fixed ropes that make it possible to guide at very high altitude. The use of fixed ropes has both opportunities and pitfalls for the guide. The opportunities are

- (I) the possibility of guiding larger groups than is possible in the Alps, with typical client to guide ratios of 4:1, though some outfits have considerably higher ratios
- (II) the need to lead the section only once (often by the Sherpas)
- (III) the fast assured line of descent.

Because the clients are essentially climbing on their own on fixed ropes, the dangers are those of loss of communication with clients and lack of supervision.

The remedy is

- (i) Intensive training of the clients to ensure they cannot make mistakes on the fixed ropes, no matter how tired and hypoxic they become. The client training should have involved previous high mountains, and usually needs a lot of revision at base camp during the acclimatising period.



(ii) *Constant communication with the guide who should be in visual or audio contact with his clients at all times while they are climbing.*

OXYGEN

There are at least two commonly used Oxygen systems used on Everest; the Russian Poisk system and the Summit Oxygen system. The latter shows some advantages with lighter cylinders and more modern regulators. Poisk Oxygen cylinders come in two sizes, the most useful size being 4 litres. They weigh around 4 kg, and are normally pressurized to around 220bar (about 210 atmospheres). This gives about 16 litre.hours of pure O₂. Many clients use the gas at the maximum rate (for Poisk) of 4 litres/hour on summit day when they will need at least three bottles for summit day. Guides will normally consume one and a half to two bottles (at about 2 litres/hour). I believe it is consistent with ethical guiding to use O₂. Sherpas will often make do with just one bottle. The best masks to use with the Poisk system are the Top-Out masks. The Summit Oxygen masks are similar but less bulky, and both also be used with Poisk cylinders.

CLIENTS

Training:

It is highly desirable that clients have previously climbed at least to 8000m. This is to ensure they have not spent their time and money to discover they have a lower altitude ceiling. The easiest and most popular 8000m peaks currently are Cho Oyu (8200m) and Manaslu (8156m). These both make suitable training mountains for Everest because they have a high success rate, are relatively safe and will help the clients to understand the effects of altitude.

The normal routes on Everest consist more of extreme camping than technical difficulty. Nevertheless, there are frequent problems with clients moving too slowly because of lack of endurance, fitness or inability to move quickly over the more technical sections. Therefore pre-expedition training should include activities to improve endurance, pacing and proprioception. In-field, it is normal to spend some of the rest days training for the specific needs of the mountain. (Example, on the Nepal side, there should be ladder training for the ice-fall)

PROBLEMS

Typically Everest often has high net worth clients, they can be quite demanding. Most client problems can be avoided here (as on any mountain) with good communication by the guide. Daily briefings and constant communication while climbing should be part of the service.

Things go wrong at altitude, even with the best preparation. At times like these, the years of close working with clients in the Alps comes to the fore. It is extremely important to have visualized the "when things go wrong" scenario before setting off for the climb, as it can be very difficult to formulate an appropriate plan while at very high altitude in bad weather.

A normal team will take between 7 and 10 hours to reach the summit. So, in total, summit day will often be 12 hours or longer. Many clients will have trained with marathons and triathlons, training for energy output up to 3 to 4 hours, and are liable to fade away long before the 12 hours is up.

Studies have shown that profound fatigue resulting in significantly later summit times are an important symptom of non-survivors, more so than the more expected symptoms of AMS such as nausea or headache. All of this means that summit day may involve the hard



decision of enforcing turn-around times.

B) Guiding on Cho Oyu

Author: Josef Simunek – Czech Republic.

INTRODUCTION

This is a short guideline how to guide clients on this I think most frequented 8000m peak in Himalayas.

I have been there first time in 1993 as a very young climber and it was my first 8000m peak. Since that time I have organized more than 13 expeditions to 8000m peaks, some of them were commercial with clients on the top. Our main goal is to climb summits without supplementary oxygen and guide clients to follow this style. We have very good experiences with this.

TIMING and DAY ORDER on CHO OYU

Typical time to for Cho Oyu is about 25 to 35 days in Base Camp. Most of the teams are arriving to Kathmandu. From there it takes about 8 days to reach Base camp which is situated in 5700m altitude. The main problem is that clients and the whole team are able to reach an altitude of 4200m by car. This is why we have to take a really intensive attention for the acclimatization process. Usually expeditions make a short trekking in South side (Nepal side of Himalyan range) or they make stops in the villages Nyalan (3700m) and New Tingri (4200m). In the surroundings of the mentioned villages clients one can make day treks to reach higher altitude and to be well acclimatized.

After arriving to BC clients usually take two days for recovering and can make short trips towards Camp 1, staying in altitudes around 5700 to 5900 metres.

The most dangerous part for Cho Oyu is under my view acclimatization adaptability because an eventual rescue action is very difficult, due there are no helicopter flights allowed and avictim has to be carried by porters to the nearest route and than by jeep to the Nepal – Tibet border which takes from BC about one day. So this is why I want to highlight the acclimatization process.

Main season is spring and autumn. In spring time most teams reach BC at around mid April and summit attempt they expect about second part of May. In autumn teams arrive to the BC from first days of September and summit days are best in last days of September till the first half of October.

To reach Camp 1 is practically very easy trekking to 6400 metres. Normally you have to cross the glacier diagonally towards the path of the West Face and than climb up by a steep part or "trekking route" to the Camp 1.

Camp 1 is situated on the ridge where teams set up tents. One time I saw there 160 tents. On the way to Camp 2 there usually are fixed ropes installed. They are installed by CTMA (China Tibet mountaineering association) expedition, usually with poor and simple ropes. Ropes are fixed by snow bars or some times with ice screws. What is a big disadvantage that there is no chance to control fix points so to use fix ropes is still under question. Normally clients are moving on the mountains without guides, because of acclimatization so

there has to be the question how high is a guide responsible in case of damage of mentioned fixed ropes.

On the way to Camp 2, which is normally situated at 7050 metres, is a first technical



passage on the normal way to Cho Oyu. At ca. 6.800 metres there is ice fall about 60 to 80 degrees steep, usually called "serac".

All people climb this passage by fixed rope. Usually there is one installed for the way up and a second one to rappel down.

Camp 2 is at a relatively safe place except with big snow falls on the upper part of the face, in this case it can be endangered by some avalanches.

From Camp 2 more teams plan to set up Camp 3 at about 7450 metres.

On Cho Oyu there is no chance to descent down to the lower altitudes like in Nepal before summit attempt, so clients spent their recovery time at the BC.

We strongly recommend making a serious acclimatization before the push to the summit.

Well there is a logic way to be well acclimatized: BC and around, than after few days we

recommend to climb to Camp 1 with some load and return back. After one day recovery

in BC we can continue with clients to Camp 1 and stay there overnight. Next days we

can continue toward to Camp 2 to reach 7000 metres and return directly back to BC.

After this we can try to climb with clients BC – Camp 1 – Camp 2 to stay in Camp 2

overnight. After this and a recovery in BC we can try to push to summit.

So we still have two options. To set up a Camp 3 and try to push to top from this point or try to climb the summit directly from Camp 2.

There are positive and also negative argues to do it like this, because we work with clients and their conditions are always different.

The reason to try to climb top of Cho Oyu directly from Camp 2 is that we can avoid a heavy carriage of all loads and equipment to Camp 3 at 7450m. Because it's only 400 metres of elevation we really have to think about it. First its "only" 400 metres so we spent a lot of team energy and effort to move all staff and load a small step higher.

Compare to let's say Shisha Pangma there it is 500 metres from Camp 2 to Camp 3 and also a long distance.

Here on Cho Oyu, the west face is a relatively steep slope. Especially when we plan to

climb to the top with supplementary oxygen it's under my view a nice and elegant variant.

Without oxygen it's also possible but the clients have to be strong. We usually have to start at 11 p.m. To reach the top we can expect between 10 to noon the next morning.

Disadvantage of this climb is that the clients are a long time outside, so there is the danger of frostbite and also we have to climb about 11 hundred metres of elevation.

One of the last reasons to try to attempt Cho Oyu directly from Camp 2 is time. If we are under pressure of time there is still a big opportunity reach the top.

Arguments to set up Camp 3 is also very relevant, because we naturally respect the old expedition rules and we can start our summit attempt a bit higher. If we want to push the top from Camp 3 we can start a bit later at about 2 or 3 a.m. morning. Well, it's still a hard decision for the guide. Camp 3 is in an altitude where we cannot have any recovery. Of course, if we have enough high altitude Sherpas to carry loads to this altitude it's still the best strategy for our clients. Camp 3 is located on a steep slope, so there is not a lot of space to set up the tents. Compared to Camp 2 with relatively flat area this is a big disadvantage. Well there are these two options and every mountain guide has to decide it with all arguments.

The use of supplementary oxygen is not highly recommended like on Everest.

The next technical passage is above Camp 3, called "rock band". It's in an altitude of about 7600 metres. The rock band is about 15 metres high, usually fixed by rope. Normally clients use jumars but if there will be a problem with fix ropes or if you don't trust Tibetan and Sherpa climbers with the fixation you have to do a relatively hard mixed climb in this altitude.



Then the ascent continues on the steep snow slope and the final part of the climb is just a mental issue. From altitudes above 8100 metres you reach a flat summit plateau which is wide open and a flat slope to the top. You have to walk in this altitude about 600 meters with elevation about 80 meters.

There you reach finally the top of Cho Oyu. To avoid misunderstandings you have to see perfectly Everest, Lhotse and Nuptse on the East. Only with this magnificent panoramic view you can declare that you are on the top of 6th highest mountain in the world.

The summit attempt generally takes place in the second half of May, though in some years it can be as late as early June. In autumn the best time to reach the top is between last week of September till the mid of October.

Descent down is usually made to Camp 2 and next morning to the Base Camp. No matter which attempt variant (from Camp 2 or from Camp 3) you use.

SHERPAS

The use of Sherpas on Cho Oyu means a lot of costs because you have to pay labour fee to Chinese – Tibetans authorities. Normally Sherpas are using oxygen but some of them still want to work for you without this.

Cho Oyu is a relatively safe mountain, except long a massive snowfalls when you can expect avalanches mostly to Camp 2 and Camp 3.

We don't have relevant numbers of fatalities for Sherpas and clients on Cho Oyu but you can also see people who wear crampons the second time in their life. To hire one mountain guide or one Sherpa per client doesn't make a sense, but of course it's a matter of budget.

FIXED ROPES

To use fixed ropes means you are not guiding, you are just accompanying clients on their own way to the top. We can call it like "via ferrata" to the stratosphere. Well, what we would like to highly recommend is don't trust fixed ropes if you didn't install them personally. There are many fatal accidents thanks to blind believing to fixed ropes. Some Sherpas are able to set up fixed ropes really professionally, some of them not. Globally we can say: climbing higher means more danger.

In this case we highly recommend learning the client skills with crampons and ice axes, no matter how tired they are.

Well fixed ropes are on the normal routes standard. But we still have to think about our personal responsibility, this means, sure, use the fix ropes, but they are not 100% save. Short rope guiding in this altitude is also possible, but it's a matter of guide acclimatization and clients capability and skills and finally also budget. Not so many Sherpas have an idea of what it means to do short rope guiding, hopefully when Nepal now is a member of UIAGM this technique will be more common also in high altitude guiding. Personally I should say I don't like fixed ropes "base camp to summit".

PROBLEMS

Cho Oyu is right now enormously overcrowded with people who want to reach their first eight thousand meter peak. So you can see technically not well prepared climbers with excellent guides and Sherpas. What is a relatively big advantage on Cho Oyu is that especially normal route is quite wide and you can move there even there are a lot of people on the route. There are two parts, I mentioned them before, which we can call it climbing. First is above Camp 1, usually called "serac" and second is the "rock band".

Especially the second part is objectively dangerous because clients are returning from the



top very tired. This part requires rappel and it could be sometimes a big trouble for the clients. The serac is also dangerous, but no like the rock band. Another big problem is the rescue in case of any health problems. You have to reach with a client a jeep, which means sometime a serious problem (communication with Tibetan liaison officers and drivers) and after that by jeep about 6 hours driving to the border with Nepal to Zhangmu. From there you can organize a helicopter transport to Kathmandu.





C) Guiding on Mt. Kilimanjaro

Author: Herbert Mayerhofer - Austria

Misery and suffering on the highest mountain in Africa

Drawing on my extensive travelling and mountain guiding in the mountains of East Africa I will try to give a rough overview of the rules of conduct which exist (although sometimes vaguely) in these crowded mountains.

The principle problem is that far too little time is taken for ascents and this is especially true for the highest of these mountains, Mount Kilimanjaro 5895m. Such adventure holidays offer too many other attractive extensions after an ascent, such as a safari or beach holiday on the coast of East Africa. This often means everything has to be achieved in a maximum of 14 days. As a result the important acclimatisation phase is much too short and the local staff and the accompanying guides feel pressurised to try to take everyone to the summit, regardless of whether they are still weak or sick from altitude. Success brings a bigger tip! Virtually everyone who makes it to Gilman's or Stella Point on the crater rim or just below it, will be pushed up, supported, and even carried! I have often heard clients say that "their neighbour or colleague succeeded in climbing to the summit", and therefore it is essential that they achieve the same. Whatever the cost... nobody wants to admit any weakness or respects the high altitude here. This makes it even harder for the guide to observe the guests constantly, to advise them and possibly to steer them towards the sensible decision of turning around.

Almost every advert for "Killi" is much exaggerated in order to get more customers who are often far too weak. To appreciate this one needs only to read once through some of the itineraries, especially those from major tour operators! It is scarcely mentioned that it takes a really good physical condition, moving in a climate which is often harsh, with unusual food that does not taste like home, or that at least 6-7 days must be spent on the trek which means moving every day often with no rest day scheduled in. The subject altitude, acclimatisation and possible altitude sickness is hardly described or explained at all.

The more client contact time that takes place in advance of the trip, for example a team meeting in advance, the more enjoyable the journey will be and there should be hardly any surprises!

Let us return to the strategy on the mountain...

The local guides have been trained a little to recognise and deal with the symptoms of altitude sickness. To recognise it is one thing but to act quickly remains a problem. As previously mentioned, success is the only thing that counts and it seems to matter less than safety. Especially on Kilimanjaro experienced hikers often behave worse than children and they don't want to recognise their disease symptoms. These are covered up and without medication is taken without the knowledge of the (local) guides in an attempt to get to the summit anyway they can. So as responsible people we can see that it's a dangerous game.

Even the dialogue within the group about this subject matter is very limited which can give the appearance that "...everyone else is doing perfectly fine except me..."

It is understandable that on such a holiday a great deal of valuable vacation time and money has been invested. As a result the very real dangers of high altitude are often overlooked. It is especially important to increase awareness of this issue in advance by clear and frank discussions about it with all clients before and during the trip.



Interestingly, we can observe on Kilimanjaro and on other famous mountains around the world a wide variety of errors made by both mountain guides and clients. It is after all the highest point in Africa and you have to have made it to the summit!

Unfortunately far too few clients prepare conscientiously for their climb. It starts in the planning phase. For example why not improve acclimatisation at the start by climbing Mt Meru or Mt Kenya. In all my travels this point was often crucial to success on Kilimanjaro. Although of course sickness from colds or diarrhoea cannot be completely avoided on a trip like this. Essentially the rule is that whoever remains healthy and complies with the rules of safe acclimatisation is successful.

On Ruwenzori or Mt Kenya some other rules apply. Here it's more about being on a journey in a unique tropical wonderland. Here you can also reach altitudes up to 5000m but the ambition and drive to reach the highest point here is less noticeably than it is for the highest mountain in Africa.

But even here I have seen a similar phenomenon (everyone's doing fine, just not me). Just above Ruwenzori a client suffered cerebral oedema. A severe deterioration in performance happened at Stanley Glacier. Their concentration declined in a very short time, they gave slurred answers to my questions and their movements became uncoordinated. It was obvious that something was wrong. Their low oxygen saturation in their blood also supported evidence that altitude was involved. The clients' husband said that she was normally like that at home (I am always faster...). The higher the mountain the weaker she became. The fact was that she either did not know or recognise the symptoms of high altitude sickness. She was unwilling to show her "weakness" before the group and especially her husband and did not want to be the only one not to reach the summit.

On "leadership at altitude" I can say that in Africa it is quite possible to do a 100% good job if you have experience and a good overview. Assuming that you yourself stay healthy of course! The careful and sensitive handling of the group, combined with good observation of each participant helps a great deal in preventing or avoiding emergency situations.



D) Glacier Traverse

Author: Jean Annequin – France

Advice for autonomous expeditions in Polar Regions and glacier traverses.

Examples

Before explaining in detail such traverses, we should focus on expeditions that will be made with clients (there are many others), this selection tends to deal with the various parameters of difficulty and engagement):

Arctic: North Pole

Antarctic: South Pole, skiing in Antarctic peninsula, ascent of Mont Winson ...

Spitzberg: South/North trek, round-trip in the Atomfjella, East-west side trek

Greenland: West/East traverse, Stauning Alpes, Liverpool lands, Amagssaliq island

Patagonia: Hielo Patagonico Norte and ascent of San Valentin / Hielo Patagonico Sur: Cerro Torre and Fitz Roy tour

Island: North-South traverse

Throughout these expeditions, we can find almost all possible issues connected to big glacier traverses.

Constraints

The constraints and challenges of these expeditions are autonomy (self-reliance), meteorological conditions and commitment.

Deciding to traverse a cold and glacial zone means to be autonomous as you cannot take porters. Every one of the group must carry everything themselves. Each participant is not only responsible for their own material, but also for the groups' material and food. It is the guides' responsibility to manage the distribution of this equipment. It goes without saying that the amount and weight is adapted amongst each of the participant's ability. Being autonomous means deciding beforehand on the essential equipment to take and leaving superfluous equipment behind. The guide is used to selecting the correct equipment to take due to their experience but for our clients it is a different matter and they will need help with this selection of personal equipment. Mobile electronics (GPS, satellite phone, emergency locating beacons, camera etc.) and their charging units (solar panels) have become more important. It is essential to spend time during the preparation meetings for the selection of these important devices, as weight is the number one enemy.

Meteorological conditions come immediately into play as often there is no way to escape them. Knowing the weather forecast so that you can anticipate and limit its influence on you is more than just interesting, as this is a serious climate. First of all, the most appropriate time of year has to be chosen. Make proper research as in certain regions heavy airstreams/low pressure zones can occur for several weeks. It is important to refer to statistics and on experienced guides who have local knowledge. A weather forecast is a plus, but not as essential as it is for high altitude expeditions where choosing the date for the summit ascent is crucial. An accurate forecast helps to prepare the expedition for bad conditions, either by going back to a sheltered zone or by digging in, prior to the storm arriving. The cold is intense and ubiquitous and must be prepared for. Being too warming can also be dangerous as sweating in overly warm clothes or boots can have serious effects (heat stroke/exhaustion, blisters on feet etc.). The wind is also an important factor to consider.

Commitment is undeniable. There is no base camp to retreat to. Once started, everyone has to be part of a team. It is not possible to get away individually from such an expedition. Often



you are far away from civilisation and rescue is very complex and time consuming to organize, if at all possible. The group should stay very closely together as a tight unit to ensure the safety of the individual. No one should dawdle behind or charge ahead.

These three features generate a notion of isolation which is often looked for in this type of expedition. Solidarity and harmony are fundamental elements in this type of expedition. Accepting to live together by helping each other and putting others before yourself is essential. It can be difficult for the team to adapt to this philosophy, especially considering the individual lives we have at home. The guide is the binding agent of the group. Involving each individual in the daily chores of the expedition is very interesting idea to adopt. Pre-empt decisions to avoid nasty surprises. On these expeditions monotony and routine is present and it is reassuring to repeat every day the same tasks such as dismantling the camp or moving on by pulling the pole as one sees the time passing and one can use it for a reference point in time. Any disruption to these routines that was not communicated beforehand may be accepted poorly within the group.

Issues

No mountain, no traverse is worth not coming back from or coming back with severe injury. Once this philosophy is accepted all decisions must keep to this maxim. The challenge is clearly to complete the traverse, but it is paramount that nothing disrupts the trip. Before starting it is essential for the guide to understand the challenges and expectations of the clients.

- What does the journey represent to each participant? Sports challenge, personal achievement, exploration...
 - What do the costs of this trip mean to each participant?
 - Apart from the costs, what are the goals in terms of their profession or family for each participant?
- But, it is also important that the guide asks this question to himself...

Preparation:

- Information to the client: the guide must be clear about the program and especially about the expected conditions on the route:
 - Length of time on the glacier
 - Extreme conditions encountered
 - Living conditions (cramped)
 - Recent level of experience for the clients
 - Technical levels of the clients
 - Clarify the role of the client and the guide's role

- It is essential to meet the clients a long time before the expedition starts as this will help with the following:

- The participants get to know each other
- To form pairs for the tents
- To make sure everyone has the correct equipment and knows how to use it
- To make everyone knows how to use the communal equipment
- To select the expedition food together in order to meet all tastes

- Involving the clients in the preparation is essential, as they must take on some responsibility. They will better accept and understand uncomfortable conditions on the trip. They can take care of the kitchen for some evenings.



Food

There are some important points for the preparations.

Some general rules:

Depending on the conditions and duration, the number of calories per person per day should be between 3500 and 5000

Variety in the diet is an important rule

Everyone should have tested the products beforehand and be happy with them

Favour neutral foods, so spices can be added individually

Breakfast is a key element. Too much sugar can cause hypoglycaemia some hours after departure

The food should be as varied as possible.

Freeze-dried products can very quickly become unpalatable

Personal material

The two most important points are the equipment for the night and the shoes.

Example for the Greenland trek of 18 days in the region of Agmassalig

<p>Feet:</p> <ul style="list-style-type: none"> 1 pair of touring ski shoes (not to tight) 1 pair of shoes type Sorel –30°. 4 pairs of socks 	<p>Hands</p> <ul style="list-style-type: none"> 1 pair of ski gloves 1 pair of down mitten 1 pair of polar woollen gloves 1 pair of inner gloves made of Meraklon
<p>Night:</p> <ul style="list-style-type: none"> 1 sleeping bag –30° 1 air cell mattress 1 inflating sleeping bad (take it long enough) 1 bivy bag 	<p>Head:</p> <ul style="list-style-type: none"> 1 balaclava, beanie and headband, one cap 1 ski mask +1 glacier sunglasses with maximum protection Sunscreen and stick for lips 1 face protection (buff).



Technical material

- 1 pair of trekking skies + poles
- skins for skis, + ski crampons
- 1 pair of crampons
- 1 light harness + 3 screw-type karabiners
- 1 crevasse rescue kit (1 ice screw, 2 autoblocks with self-lockers, 1 120m rope and 3 karabiners)

Clothing

- 2 sets of underwear type carline
- 1 set of polar clothing
- 1 waterproof jacket and pants (with good hood)
- 1 down jacket with hood (-25°)
- 1 set of clothes for the travelling on the airplane

Pharmacy:

- Aspirin
- antibiotic treatment
- antiseptic eye lotion

Security material:

- avalanche transceivers
- Shovel
- Probe

1 blister kit for feet

- 4 foot warmers
- 4 hand warmers
- 2 body warmers

For eating:

- One plastic bowl + spoon + knife

- The sleeping bag should be very large, so there is enough space for the inner shoes and the gloves for drying during the night. Furthermore, it should have enough space for electronic devices which are sensitive to cold.
- Synthetic or down material? For cold regions where temperatures never exceed zero degrees, synthetic material guarantees constant warmth. When it is possible to dry the material, down has more advantages due to its higher warmth to weight and compressibility. A recent development in treating down material with Teflon so that it prevents the down losing the loft when it's very humid is a useful technology for these types of expeditions.
- The system of using two stacked mattresses has big advantages: one foam mattress, one inflatable mattress (there are some inflatable mattresses that including a down filling for extra insulation)

Common material



- To carry or to pull material: sledges in different sizes or pulks. Be careful with the glacier terrain consisting crevasses, it is important to rope up the pulk, like a human being, so that it doesn't get lost in a crevasse.
- Sleeping: take geodesic tent for 3 and use it for 2 persons for these kinds of expeditions the amount of material in the tent is higher as having space is important. Tunnel tents are not necessarily an advantage when the wind blows. Tents are anchored with stakes or snow bags.
- In order to have meals all together, a tent in form of a tipi placed on top of a whole in the snow big enough for all to shelter in can be used if there is enough snow to dig a hole.
- For cooking, petrol fuel stoves are the most powerful and appropriate. This combustible has the best heating performance-to-volume ratio for transporting. Gas freezes and it is not advisable to use.

Managing the traverse day by day

- A classical mistake is wanting to stick on the same program every day during the traverse
- It is important to start smoothly into the rhythm of the traverse. In the beginning short days have to be imposed, and also it is essential to factor in time for setting up the camps and for preparing the food. Initially, the group is in a period of flux where each participant needs to find their own tasks and role. Eventually the team builds and becomes coordinated, movements then link together easily and the group operates in harmony. It is common that after a while the weariness, monotony, tiredness and close promiscuity have an impact on the group and tensions within the group members can arise. A break is then needed. A redistribution of the roles can help in this case. The guides' endurance is especially important to maintain the focus.
- Be attentive to small injuries from the beginning, such as blisters on the feet.
- Take advantage of mild weather conditions to recover: you can walk in blizzards or wind, but you can never recover when the weather is difficult as it is difficult to eat and sleep.
- The guide is certainly there as in ski touring to lead the group for example showing the way and taking care of the participants. Often there are other participants who can make the trail, navigate with the map or GPS and the guide should not hesitate to delegate some important tasks to these clients (only with good weather conditions) as they will feel more involved.

Managing the camp

- if the route/traverse is in a zone where the polar bear is present (Spitzberg, Greenland coast, Baffin island, Ellesmere, Bilot...) it is important to separate the places where you eat and where you sleep, leave around 30m-40m between them. A mess tent for the meals can be a huge advantage for the moral and the warmth. It also allows to overcome some mistakes when preparing the food or handling and fixing the stoves.
- Almost at all places during the traverse, it is important to build up snow-walls around the tents. A height of 130cm is the minimum in certain conditions to guarantee that the tent remains in place.
- Once taken the decision building up the camp, it is important to define a place for the latrines and that everyone respects it in order not to pollute the snow that will be used for preparing the food
- Depending on the position and place of the traverse, the weather might allow for drying equipment (sleeping bags/tents) for a short period during the day you should not hesitate to take advantage of it. This has to be considered in the mornings in order the material is easily accessible.



E) Ama Dablam

Author: Chris Semmel - Germany

Typical Scenario

The Ama Dablam is a very famous and sought after mountain due to its beauty and isolated situation and can be found above the famous monastery of Tengpoche. The Ama Dablam is visible from far and famous for "only" being 6851m altitude. Comparable to the Matterhorn, this might be the reason why so many want to climb it. The base camp is easily reachable and another reason why it is one of the most visited mountains of the Himalaya, despite requiring a very high technical level of competence (Rocky passages up to UIAA 5, slabby rocks, snow slopes passages to 50°, and short vertical sections through bergschrunds). Most expeditions take around four and a half weeks (32 days), including arrival and departure, when taking the normal route (southwest ridge). Once the base camp is reached, it takes around 16-18 days to complete the remaining 2200m altitude of difficult terrain to attain the summit.

Characteristics of the route

The lower part of the route is dominated by rock climbing and the upper part consists of a steep snow slope. From base camp to camp 1 the difficulties lie just before camp 1 due to steep slabby rocks, fixed ropes are already necessary here especially when the slabs are wet or still have snow. Camp 1 offers just one narrow tent site. The section from camp 1 to camp 2 is relatively short and this leads over a mainly fragile but rather easy, less steep rock ridge. At camp 2, there is only tent space for 4 to 6 climbers; this is why it is often skipped. The main difficulties start on leaving camp 2, first, it starts with very steep slabby rocks, followed by crossing to the key passage: a vertical, almost overhanging 15m crack dihedral in the rock. After that the ridge gets flatter before escaping to the western flank to avoid a steep section using the flank is usually necessary in most cases.

Bergschrunds are often the main difficulty to reach Camp 3 at the bottom part of upper snow field which is clearly visible. The summit day is characterised with a bergschrund above the camp. Up to the summit, a 40° to 50° steep snow slope has to be overcome, which becomes less steep towards the end. Camp 3 can be endangered through icefall (seracs) or avalanches.

The difficulties

The crux of Ama Dablam is due to the technical difficulties, the narrow and tight spaces for camping in camp 1 and 2 and that once above camp 2 it is very problematic to go back with an injured or altitude sick person.

The main focus has to be put on securing the fixed ropes when it is a guided trip. An individual guided tour with one or two guests on the rope is the easiest to manage as many passages can be climbed in a rope team. Due to its high difficulties and limited camp possibilities, the Ama Dablam is mainly appropriate for individually guided expedition in alpine style as difficulties can be overcome faster and without a big logistical effort in building up the camps and complex fixed ropes for security. The Ama Dablam is not suited for expeditions with many participants. Arrangements within the neighbouring teams and expeditions are most important.

Fixed Rope - Insurance

As many passages lead over very exposed and steep compact rocks, the anchors and fixed ropes have to meet certain quality standards. Through the many changes in direction of the route anchor points are often exposed to unfavourable loading angles at very high forces. Old fixed ropes should not be used and to avoid misuse removed and carried down. This bad habit of leaving old fixed ropes is not only a violation of ethical and ecological guidelines and general rules of good conduct but they also are a security risk. In 2003, a mountain guide fell to his death because of an old fixed rope broke. This fixed rope was a common rope made of



polypropylene that was not UV stabilized. Averaged rope tests of it showed without any mechanical damage a variance of breaking strength between 0.6 and 8 kN!!!

On Ama Dablam only polyamide or polyester static ropes with a classification A or B (according to EN 1891) should be used. In the upper snowfield section however it is possible to use thinner ropes. All fixed ropes have to be stripped during the descent and taken down! The most appropriate tactic from an ethical and best experience point of view is to climb this mountain as a rope team where all parts are climbed as a team. The route is perfect for this alpine style.

Participants

Participants need a high level of technical experience. To lead this expedition the mountain guide needs to know and check the technical experience of the participants beforehand. It is important to be well acclimatised. Due to the short stay at the base camp and missing possibilities to acclimatise to the altitude rash attempts to climb this peak should be avoided. Even if the altitude of the mountain (around 6800m) does not demand a long acclimatisation time, the difficulty of transporting an altitude sick person above camp 2 can be very difficult and dangerous!

A thorough acclimatisation programme before reaching base camp is advisable. This can be achieved by trekking in the Khumbu region, such as to Everest base camp or by climbing Island Peak, Pokalde or Lobuche.

Sherpas

At the Ama Dablam, only technically trained "Climbing Sherpa's" should be used. The fixed ropes must always be checked by the guide. For led expeditions the main task is securing all the fixed ropes.

Problems

Retreat due to bad weather conditions above camp 2 can be very difficult. The approach to the summit ascent should be defensive and careful.

Similarly the evacuation of injured or altitude sick persons is very problematic above camp 2. This is why emergency oxygen supply and if possible hyperbaric chamber (Gammov bag) should be available at camp 3 for guided expeditions. Alpine expeditions should emphasise on sufficient acclimatisation as it is logistically difficult to carry emergency oxygen supplies and a hyperbaric chamber. As the high camps are small and tight they require a good management between the different groups. Expeditions with many participants (more than 10 people) should not be on the Ama Dablam. The best way to climb this mountain is by individual guided climb teams. The technical experience of the participants has to be at a very high level in order to master the difficulties. Due to the compact terrain above camp 2, it is not always easy to install the fixed ropes. For this mountain the Sherpa's need a climbing certificate.



F) Alpine Style

Author: Terry Ralphs – Great Britain

Alpine Style Expeditions to remote mountainous regions

Introduction

This type of expedition is often in the pursuit of first ascents or just to appreciate solitude and wilderness. As such they operate in remote areas which can have access and communication problems. An example of this type of expedition could be a small group based in the remoter mountains of Kyrgyzstan, Nepal, India, Sikkim, etc. on 5000m to 6000m high peaks. These are generally classified as “IFMGA Individually Guided Expeditions” as an IFMGA guide accompanies the clients at all times.

Preparation

Preparation is probably the most important consideration that will contribute to the success of an expedition. The pre-emption of problems along the expedition path not only starts from being on the mountain but also whilst travelling to the destination. It is important to check with the foreign office to see if there are any travel restrictions in the destination country as these can change quickly in the more politically unstable countries.

It is important to arrange that any visa or travel/peak permits are obtained in good time, and you should check all the nationalities for your group so that everyone complies.

In some countries a liaison officer will be assigned by the government to travel with the expedition and the expedition may have obligations to look after this officer.

A local trustworthy agent who can deal with logistics on arrival to the airport is highly recommended. In countries where the language is not understood by the expedition leader a trust worthy translator is worth considering as it is important to be aware of any local political instabilities.

Understanding the political environment is not only important when travelling in remote regions such as when passing police check points (permit and visa considerations) and villages (hostile locals) but also in the cities such as in the shopping centres where not only pick pockets are present but also there can also be gangs of criminals. Remember rich western clients can be easy pickings.

It is also important to have a communication line to the local agent in case of emergencies; this is best done by satellite phone. Sometimes a bond is required by the rescue services before they will start a rescue, so that they know they will get paid. It is best to make these arrangements prior to arriving in the country.

On route

It is important to work with the local agent to ensure that reliable transport and provisions for the expedition are provided. When going to remote wilderness the last thing you need is for your bus to breakdown and have to spend the rest of the expedition searching for a solution for onward travel. This however should be the expedition leader’s responsibility.

Approach on the mountain

When working in remote regions it is prudent to have the best back up and support available to you. Operating as a single guide has little in the way of reserves if anything goes wrong (illness or injury of an expedition member, including the guide). It is good to work with at least another guide so that there is additional support on the mountain. It is also important to have good communication between guided teams usually with radios. It is also prudent to moderate the risk management as you normally have very limited rescue and medical facilities.



A solid comfortable base camp with a local cook and local guide helps with moral and also gives important emergency support. A good diet of fresh food (vegetables and fruit) at base camp really helps with the team performance.

Hygiene is also very important as most health problems on expedition are stomach problems caused by bad hygiene. Hand washing facilities at base camp are vital and a supply alcohol wipes/gel available.

Normally high camps are then set up above this base camp on the objectives and a lightweight alpine approach is taken on the ascent of the mountain.

Acclimatisation

There should be an appropriate plan for acclimatisation and a fall-back for people who don't acclimatise well.

Weather forecast

It is important to have access to a reliable weather forecast as these expeditions can be committing especially above the high camp.

Expedition Doctor

Having a doctor on the expedition is a good idea and ideally they will also have the adequate specialist medical skills required. The doctor should have a defined responsibility for the medical treatment of the group.

Expedition First Aid Kit

The expedition first aid kit should be separate from the guide's first aid kit. The expedition first aid kit should contain the relevant expedition drugs (such as high altitude drugs and antibiotics) and surgical equipment (syringes and sutures etc.) for the expedition. The guides should know how to administer the drugs if no doctor is around or on trip.

Local Support Staff

The expedition leader should be responsible for the safety of any local support staff such as cooks and porters.

Respect for the environment

Everything other than organic waste should be transported out and no litter whatsoever left behind. No wood fires - leave firewood for local people (even if it seems plentiful). At base camp dig a deep latrine away from any water course and bury it carefully after use.

Local relations

Be friendly and respectful towards local people and repay any kindness generously. The best thing to give to people living in high mountain areas is fresh fruit + vegetables, so take extra. Buy produce from them but only if they have it to spare!



G) Active Volcanoes

Author: Collegio Nazionale Guide Alpine Italiane – Italy

Rosario Basile

CRGAV Sicilia

Alfio Ponte

CRGAV Sicilia

Stefano Branca

INGV Catania

Cesare Cesa Bianchi

CONAGAI

Guidelines for accompanying professionals on active volcanoes

Models and methods for risk mitigation

Over the past 20 years, volcanological and geophysical investigation have been greatly improved by developments in technology and calculation processes. As a result these two decades have seen the passage from observational volcanology to modern volcanology.

This has occurred thanks to creation of multi-parameter measuring systems and a constant data influx that allows researchers to numerically quantify the effects associated with volcanic processes. In turn, these can now be interpreted by physical models which aim at providing a better definition of the volcanic hazard.

In this context, state-of-the-art knowledge regarding volcanic processes and their hazards is an important tool for people like volcano guides, who are involved in mitigating the risk in volcanic areas. Hence, a synergistic collaboration between the research institutes that monitor and survey volcanoes, and the volcano guides who observe the activity of Italian volcanoes on a daily basis, is fundamental. This will benefit visitors of a better and safer use of the summit volcanic areas

Like all outdoor activities, hiking and mountain climbing, ski mountaineering on or near active volcanoes, implies being aware that an exposure to risk is by no means negligible.

The Volcanological Guide is that professional who teaches and accompanies visitors to active volcanoes

Volcanological Guide

- Is enabled after a training of long duration and high level. The training is highly specialized in the field of volcanology.
- Accompany individual groups climbing up volcanoes, ensuring safe progression over difficult terrain of medium and high altitude.
- Use their skills to mitigate the risk arising from an approach to, crossing of or stopping in an active volcanic area.
- Subject to specific "safety standards", makes it possible to observe volcanic phenomena (eruptions) at close range.
- Contributes to clients' cultural awareness by providing accurate information regarding the characteristics of volcanic environments and the phenomena associated with them.

Mountain guide

- Through a focused training and specialization, build their skills and functions relating to outdoor activities on active volcanoes.
- Performs all activities of Volcanological Guide



Risk evaluation

Risk evaluation depends on excellent local knowledge and the capacity to immediately read and interpret the volcanic phenomena that occur.

$\begin{aligned} & \text{Knowledge of the area} + \text{Knowledge of the phenomena} \\ & = \\ & \text{Interpretation and Assessment} \end{aligned}$

However, risk evaluation can be strongly influenced by interactions between volcanic phenomena, local weather conditions and anthropological factors.

CLIMATIC CONDITIONS:

- Wind
- Fog – Poor Visibility
- Rain
- Humidity

ENVIRONMENTAL CONDITIONS:

- Anthropological Factors
- Snow Coverage
- Presence Of Streams, Creeks And Rivulets
- Soil And Vegetation
- Buildings And Artefacts
- Dams, Weirs And Reservoirs
- Cableways

HUMAN FACTORS:

- The Group
- Physical And Technical Level
- Psycho - Motivational Level



When considering active volcanic areas three main contexts have been identified

- 1) SUMMIT CRATERS IN DEGASSING PHASE
- 2) SUMMIT CRATERS IN ERUPTION
- 3) FLANK ERUPTIONS

1 – Summit Craters in degassing phase:

- TERRACED CRATERS
- CHASM - PIT CRATERES
- GAS EMISSIONS

2 – Erupting summit craters:

- STROMBOLIAN EXPLOSIVE ACTIVITY
- EXPLOSIVE ACTIVITY – LAVA FOUNTAINS – SUB-PLINIAN ERUPTIONS
- EFFUSIVE ACTIVITY

3 – Flank eruptions:

- PRE-ERUPTION PHENOMENA
- EXPLOSIVE ACTIVITY
- EFFUSIVE ACTIVITY

Evaluating the risks for hikers and/or climbers in such areas requires a rapid reading and interpretation of geomorphological and geodynamic structural elements.

SUMMIT CRATERS IN DEGASSING PHASE

TERRACED CRATERS

- Presence of impact craters
- Presence of juvenile and non-juvenile lithic material
- Crater rim stability
- Crater rim collapse
- Direction and development of fracture systems

CHASM or PIT CRATER

- Stability of walls
- Detachments- detachment niches – landslides
- Partial or total obstruction of the crater bottom due to a lava flow or landslide debris

GAS EMISSIONS

- *Direction of the plume*
- *Active Degassing*
- *Passive Degassing*
- *Degassing from fracture system fumaroles*
- *Passive emission of lithic ash*
- *Passive emission of juvenile ash*
- *Phreatic Explosions*

SUMMIT CRATERS IN ERUPTIVE ACTIVITY

STROMBOLIAN ACTIVITY

- *Number of vents*
- *Morphological structure of the vents*
- *Direction of the explosions*
- *Height of the explosions*
- *Frequency of the explosions*
- *Ballistic pyroclastic material deposited around and downwind of the vent*
- *Projection of ash*
- *Opening of new vents*

LAVA FOUNTAINS AND SUB-PLINIAN ERUPTIONS

- *Number of vents*
- *Morphological structure of the vents*
- *Jets of lava*
- *Eruption column*
- *Ballistic pyroclastic material deposited around and downwind of the vent*
- *Pyroclastic material from the eruption column falling downwind (bombs, lapilli, clinker, ash)*
- *Collapse of the side of the cone*
- *Formation of pyroclastic flows*
- *Magma interacting with water/snow: hydro-magmatic and/or lahar explosions*
- *Opening of new vents*

EFFUSIVE ACTIVITY

- *Lava overflowing crater rims*
- *Emission of lava from vents on the sides of the cone*
- *Formation of fracture systems connected to the active vents*
- *Collapse of the side of the cone*
- *Magma interacting with water/snow: hydro-magmatic and/or lahar explosions*



FLANK ERUPTION

PRE-ERUPTIVE PHENOMENA

- Ground motion due to seismic activity
- Slope instability due to seismic activity
- Formation and propagation of fracture systems
- Considerable ground deformation and collapse
- Gas emission from developing fracture system

EXPLOSIVE ACTIVITY FROM THE VENTS

- Number of vents
- Morphological structure of the vents
- Spattering
- Strombolian activity
- Lava fountains and formation of an eruption column
- Direction, height and frequency of the explosions
- Ballistic pyroclastic material deposited around and downwind of the vent
- Projection of ash and clinker
- Pyroclastic material falling downwind of the eruption column
- Opening of new vent

EFFUSIVE ACTIVITY

- Temperature of the lava
- Forward speed of the lava fronts
- Formation of lava channels
- Lava tubes
- Ephemeral vents
- Temporary obstruction of the vent
- Magma interacting with water/snow: hydro-magmatic and/or lahar explosions

The environmental contexts previously identified as summit craters in degassing phase, summit craters in eruption and flank eruptions must be analysed on the basis of four main phases:

**APPROACH
CROSSING**

STOPPING

MOVING AWAY



A system structured in this way makes it possible to develop complex and varied techniques and methods for eliminating risk. Only through risk mitigation can the established aims be satisfactorily achieved.

RISK ELIMINATION

OBJECTIVES

- CLOSE OBSERVATION OF THE PHENOMENA
- OUTDOOR ACTIVITIES
- SKI MOUNTAINEERING– TREKKING –CLIMBING ETC.
- CULTURAL ENRICHMENT

In many countries professional guides who accompany visitors on active volcanoes may be subject to severe regulatory restrictions and, in some cases, are even forbidden from doing so by those institutions responsible for safety.

The specific training of increasingly accredited, highly qualified professionals could be an intelligent 'short-term' investment in the purposeful outdoor activity work carried out by the alpine guides.

The future will see an increasing number of trekkers, climbers and tourists tread the adventurous slopes of our fascinating volcanoes.



H) Guiding on Svalbard

Author: Sigmund Andersen - Norway

Norwegian IFMGA mountain guide

Associated Professor at UiT, The Arctic University of Norway

Guiding and living on Svalbard since 2004.

Responsible for the Arctic Nature Guide program on Svalbard since 2010.

About Svalbard

Svalbard is the archipelago between 74° and 81 °N east of Greenland and north of Norway in the high Arctic. The main island is Spitsbergen with the size of 38 square kilometres.

Svalbard is under Norwegian government, and has no native population. Svalbard was discovered by the Dutch explorer William Barents, seeking the north east passage in 1596.

Since then Svalbard waters and territory has been used for exploiting nature resources and polar explorations. The first decades after the Svalbard discovery its nature resources attracted a huge fleet of European wale trappers. They did harvest on a rich whale and walrus population in the fjords of Svalbard, with land-based stations to process wale oil.

These stations and the graves of unfortunate whalers still remain as culture heritage. Later more land based trapping parties, exploration and scientific expeditions have left several remains. It was not before the coalmining started in the beginning of the 19th century

Svalbard got permanent settlements. The main settlement is Longyearbyen with 2700 inhabitants(in 2021). It is situated above 78°N and that makes Longyearbyen one of the

northern most settlements in the world. The town has regular flights from mainland Norway and is structured like an ordinary small Norwegian municipality. Svalbard is important in a geopolitical perspective, mainly because its rich deposits of natural resources (seafood, coal,

oil, gas minerals). Especially under the cold war but even now the islands are strategically important. This is why the Russians always have had settlements here. According to the Svalbard Treaty there are no military activities on the islands.

Tourism on Svalbard

Tourism was by the government until the 1990s not a priority business on Svalbard, but during the last 4 decades it has been a change in this policy and tourism has been an acknowledged business. The number of tourist visiting Svalbard has increased from 20 000 in 2000 to nearly 140 000 in 2019

The tourism on Svalbard is usually nature based, exclusive and in small groups with a guide. The exception is the expedition cruises on vessels that take between 20 – 200 passengers exploring the Svalbard waters and beaches. For the smaller groups there are different



alternatives for exploring the Svalbard nature. In the summer season there is sun 24 hour and tourist are offered multiday and shorter hikes, sea kayaking, sailing and fjord cruises. Summer on Svalbard means 3- 4 months with temperatures between 4 – 12 degrees celsius. Except from the high glaciers, most of the snow is melted. Winter is 8 months of snow and temperatures below zero, 3 months with no daylight and harsh weather condition, but also magical northern lights and days of cold and quite beauty. When sun is returning in the beginning of February the tourist winter season starts, lasting until mid-May. During winter on Svalbard dogsledding, ski expeditions and snowmobile excursions are the main activities. Then smaller groups are traveling in huge untouched territory, crossing frozen fjords, glaciers and mountain passes exploring the nature, wildlife, culture remaining and experiencing the sense of belonging and identification to this arctic nature.

Governmental regulations

Tourism on Svalbard is in general regulated by the Svalbard environmental act and by the regulation of tourism, fieldwork and other travel at Svalbard. Guides entering Svalbard are obliged to familiarize themselves to these regulations. In a short summary this is what to consider: All guided field parties must send in a notification of travel plans to the local authorities (Sysselmesteren) latest 8 weeks in front of the planned trip. Sysselmesteren will set an amount for Search and Rescue (SAR) based upon the type of activity, the geographical area you are planning, your activity and the group size. The insurance must be presented to Sysselmesteren on Svalbard upon request before departure of activity.

Mandatory safety equipment

For getting the expedition approved you must bring satellite based emergency communication. An emergency beacon (PLB) that is sending out a distress signal and your location is obligatory. The identification (LC-) number of your PLB must be added to the notification. That gives the SAR operation an opportunity to get a better overview of the situation if a PLB alarm is released. For better communication in case of an emergency it is in addition advisable to have a possibility for two-way communication. Iridium satellite phone is recommended. It could as well be smart to bring a maritime radio for direct communication with rescue helicopter, especially in unfavourable weather when a landing is difficult. Both satellite phone and PLB are possible to rent in Longyearbyen. Other special safety equipment required for expeditions on Svalbard is Polar bear protection. The group must have both rifle for big game hunting (minimum calibre 308) and signal pistol/ flares. For renting firearms in Longyearbyen the Norwegian Firearms Act applies. You must both document skills in weapon handling and a certification of good conduct from your home

police. The exception is if you have a valid firearms permit or valid European Firearms Pass. Then you can rent firearms without applying for a permit.

Mandatory safety routines

As important as the right safety equipment are good safety routines. Sysselmesteren demand that you enclose routines for Polar bear safety, both during travel and in camp. The basic safety principles are to travel with the group tight, seek terrain with an overview, use your sight and binoculars for spotting and have a polar bear watch outside at all time in camp. The guides sleep with clothes on and have a plan for quickly get in position if the watch spots a bear. Smaller parties traveling inland can consider to use trip wire for alarming a polar bear visit to camp. That gives the whole group an opportunity for sleep. Compared to a woken watch trip wire is a much less reliable safety routine. On the other hand, when camping inland the chances for a polar bear visit is less than by the shoreline.

Animal life

The Polar bear is a maritime animal. It preferably feeds on seals on the sea ice, and mainly follows the sea ice during the seasons. Totally Svalbard islands have approximately 3000 polar bears, but is clearly an endangered animal, threaten both by climate change that decrease their hunting and reproduction area and different wind and sea transported toxics that have negative effect on the immune and reproductive system. Svalbard also have a rich wildlife of immigrating seabirds, seals, walrus, reindeers and polar foxes The Svalbard environmental act is giving guides and tourist groups responsibility not to disturb animal life. Local temporary regulations can be implemented for further protection of the animal life. In winter, fjord areas can be temporary closed for human traffic to give the wildlife space to feed and reproduce on the few fjords that still have some winter sea ice left.

Sea ice

The sea ice on fjords has traditionally been used for shorter and more convenient routes for travel on Svalbard in the winter. From February to end of May frozen fjords form efficient routes for both traversing and crossing. Travel safe on sea ice for long distances demands caution and knowledge. This competence has been even more important the last decades, when global heating restricts and weaken the sea ice. Either from warm Atlantic water being pushed into the fjords, heavy storms braking up the ice or from approaching warm air or rain. When planning to travel on sea ice it is recommended to seek information about the sea ice condition at the moment (ice charts, satellite images). Search the weather forecast and analyse what effect the weather will have on the sea ice where you will travel. Drawing a



picture of the fjord topography by reading sea charts is also helpful. You want to avoid shallows, fjord bed ridges, shoreline point or other characters that can cause sea current and weaken the ice. Before entering the ice it is advisable to get an overview of the sea ice you are crossing. Warning signs of weak ice can be darker colour on the ice surface, open cracks or seals that are gathered in groups instead of spread out. It is also recommended to drill and measure the ice thickness. You can use your ice screw, and investigate if the ice is solid and thicker than 15 cm. Be in mind that the ice quality and thickness is different over a distance. In a group we like to travel with some distance to reduce the load. For rescue we bring ice pegs or are prepared to use skiing poles. A rescue rope we also have easy reachable.

Glaciers

Another element of ice is the Svalbard glacier. 60% of the land is covered with glacier ice, and they are much used for traveling longer distances. The glaciers are as well being affected by the global heating. They are retreating, causing some new challenges for travellers. Especially significant is this on the inland glaciers. The melting on many of these glaciers make an earlier smooth entrance much more chaotic, with much micro terrain of moraines and melting rivers. Also the high glacier passes get steeper and with more crevasses. In general crevasses are fewer on the Svalbard glaciers, due to the permafrost, less movement and their mostly polar character. But when the glacier front runs out to a fjord it is heated, moves faster and have fields of crevasses in the front section. Being polar or sub polar makes many of the Svalbard glaciers surging. The rhythm of a surge is unpredictable and different from glacier to glacier. Usually a glacier can surge for a couple of years. During that time the surging glacier can move forward from a few hundred meters to several kilometres. The movement of the surge cause great destruction to the glacier high up in altitude. A flat and easy to travel glacier can become impassable during a couple of years. When the tension and movement pressure is out, the glacier is melting again, crevasses are filled with snow during the years and after a decade or so the glacier is fine to travel on again. Both the fact that Svalbard has surging glaciers and the ongoing melting underlines the need of seeking information about the glacier where you plan to travel.

Weather

When heading on to the glaciers of Svalbard you often travel in high altitude area where the terrain gives you little shelter for incoming strong weather. Traditionally when the sea ice where covering most of the surrounding waters, much of Svalbard had a continental inland weather. That meant long periods during winter with high pressure, little perspiration and cold temperatures. Now with much less sea ice, Svalbard has become more like the northern coast



of Norway. The southwest incoming low pressures travel over warm water all their way up to Svalbard. They are more frequent, stronger and with more perspiration. Even with rain up to high altitude in the winter. This can cause a critical situation to a group out in the field and make a more unstable snow cover, weaker sea ice and open melt water rivers inland. To be prepared for strong weather it is advisable to get a frequent weather forecast. It is good to know some hours ahead when a storm is approaching. That gives you time to find a camp position that is favourable in the forecasted wind direction. Solid tents with strengthened double set of tent poles are often used.

During the last years more and more rescue operations has been released due to weather. Both because groups do get trouble during storms and because of cold injuries.

Rescue service

On Svalbard it is Sysselmesteren that is the local rescue operator. Of recourses they have an office of 12 police officers, a volunteer rescue group, a 88 meter long service vessel and a professional rescue helicopter unit. There are two Airbus AS332L1 Super Puma helicopters with a crew of 6, including a rescue swimmer and an anaesthesia doctor. With several fuel depots on the archipelago the rescue helicopter does have a good range. It is frequently handling long distance rescue operations to fishing vessels in the Barentsea, and has also done medical evacuations from North-east Greenland. Its main limitation is low visibility that often can be the problem on inland glaciers.

USEFUL LINKS:

Digital map: <https://toposvalbard.npolar.no/>

Sea ice chart: <https://cryo.met.no/en/latest-ice-charts>

Daily updated satellite images: <https://apps.sentinel-hub.com/>

Governmental regulations: <https://www.sysselmesteren.no/en/tour-operators/>

Firearm regulations: <https://www.sysselmesteren.no/en/weapon/renting-firearms/>



3. Main Sources

TUCKMANN, B.W. (1965): Developmental sequences in small Groups, Psychological Bulletin, 63, S. 384-399.

SCHÄDLE-SCHARDT, W. (2002): Angst – was nun? In: Berg und Steigen – Magazine for Security and Risk in Mountaineering, Innsbruck.

SCHINDLER, R. (1957): Grundprinzipien der Psychodynamik in der Gruppe, Psyche 11 (5) S. 308–314

LÜCK, H. E. (1996): Die Feldtheorie und Kurt Lewin. Eine Einführung. Psychologie Verlags Union, Weinheim.

LERCHER, A. (2001): Gruppe & Dynamik. In: Berg und Steigen – Magazine for Security and Risk in Mountaineering, Innsbruck.

MC CAMMON, I. (2002): Evidence of heuristic traps in recreational avalanche accidents. ISSW Penticton 2002.

http://monosar.org/avalanche_safety/article_avalanche_study_mccammon_human_factors_traps.pdf

BRAUN, R. (2010): Wie man von der Angst zur Liebe kommt.
<http://www.trinergy.at/nlp-kompakt-blog/?cat=1>



4. Secondary Literature, Links, Memos, Examples

Wellhöfer P.R. (2001): Gruppendynamik und soziales Lernen, Lucius & Lucius, Stuttgart.

Gilsdorf, R. u. Kistner, G. (1995): Kooperative Abenteuerspiele, Praxishilfe für Schule und Jugendarbeit, Seelze-Velber.

Meier, Ch. (2002): Spielraum für Wesentliches, Bw Verlag.

Braun, R. et.al (2004): Die Coaching Fibel. Vom Ratgeber zum High Performance Coach. Linde Verlag Wien.

Braun, R. et.al (2005): Führen ohne Drama. Linde Verlag Wien.

Berghold, F. / W. Schaffert (1997): Höhenakklimatisation und Höhenmedizin.
[Sonderdruck aus Schutzimpfungen und Reisemedizin. Hrsg. Dr. R. Lösch]. Balingen.

Berghold, F. / W. Schaffert (2001): Handbuch der Trekking- und Expeditionsmedizin.
Praxis der Höhenanpassung – Therapie der Höhenkrankheit. DAV Summit Club. 5. Auflage.
München.

Höbenreich, C. (2002): Schneller, Höher, Weiter. Reise- und Akklimatisationsplanung beim
Trekking und Höhenbergsteigen. In: Berg&Steigen 2/02. Zeitschrift für Risikomanagement
im Bergsport. Österreichischer Alpenverein 2002. S. 27-30. Innsbruck.

Hochholzer, T. (1996): Trekking und Höhenbergsteigen. Ein medizinischer
Ratgeber. München.

Hochholzer, T. / M. Burtscher (2011). Trekking & Expeditionsbergsteigen.
Ein medizinischer Ratgeber. Panico Alpinverlag. Köngen.

Lämmle, T. (2000): Höhenbergsteigen. Technik, Taktik, Training. Unveröffentlichte
Diplomarbeit am Institut für Sportwissenschaften. Universität Innsbruck.

Lämmle, T. (2010): Höhe x Bergsteigen. Die taktischen Grundregeln des
Höhenbergsteigens. DAV-Summit-Club. München.



Mees, K. (2005): Höhenanpassung. Höhenkrankheiten und Gesundheitsrisiken. Vorbereitung und Training. Bergsteigen, Trekking und Expeditionen. München.

Pollard, A. J. / D. R. Murdoch (1998): Praktische Berg- und Trekkingmedizin. Two-in-one- edition. Wiesbaden.

Roach, R. C. / Bärtsch, P. / Hackett, P. H. et al. And the Lake Louise AMS scoring Consensus Committee (1993): The Lake Louise acute mountain sickness scoring system. In: J.R. Sutton, G. Coates, C.S. Houston (eds.) Hypoxia and molecular medicine. Queen City Printers. Burlington, VT.



5. Authors

Mair Paul, Mag. Ing., IFMGA Mountain Guide (AT)

Winkler Michael, Dr., IFMGA Mountain Guide (AT)

Würtl Walter, Mag., IFMGA Mountain Guide (AT)

Zörer Walter, IFMGA Mountain Guide (AT)

Update 2022 supported by:

Saunders Victor, IFMGA Mountain Guide (GB)

Hawse Angela, IFMGA Mountain Guide (USA)

Fouinat Laurent, GRIDA (NO)

Layout: mc2alpin





Expedition/Trek..... from.....till.....
 T R E X – Check for: (name, age)

1	Date																	
2	Sleeping Altitude	(last night)																
3	Highest daily altitude	(today)																
4	Travel time / altimeter	(today)																
5	Resting pulse	(just after waking up)																
6	O ² saturation	(measured with Pulsoxymeter)																
7	Pulse	0	up to 5 beats over the normal rest pulse	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	6 till 15 beats above normal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	16 till 30 beats above normal	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	> 30 beats above	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
8	Sleep	0	normal, usual sleep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	unusual sleeping disorder	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	heavy sleeping disorder	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	complete insomnia	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9	Breathing	0	normal breathing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	some breathing complaints	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	difficulty breathing during exercise	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	difficulty breathing at rest (dyspnea)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
10	Headache	0	no headache	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	slight headache	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	moderate headache	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	massive headache	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
11	Appetite / Nausea	0	normal appetite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	loss of appetite or mild nausea	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	moderate nausea or vomiting	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	severe nausea or vomiting	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
12	Urine	0	clear and copious	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	moderate and some.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	dark yellow and little	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	hardly any urine and very dark	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3



13	Stools	0	normal (shape able)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	soft	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	very soft	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	diarrhoea (liquid)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	constipation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
14	Fatigue / Weakness Performance ability	0	no Fatigue – weakness; no performance limitations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	low fatigue – weakness; small performance limitation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	moderate fatigue – weakness; moderate, continuous drop in performance	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	great fatigue – weakness; strong, sudden loss performance	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	constipation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
15	Dizziness (vertigo)	0	no dizziness	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	mild dizziness	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	moderate dizziness	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	severe balance problems	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	constipation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
16	Injury	0	no injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	slight, small injuries	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	limiting injuries	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	serious injuries	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	constipation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
17	Illness	0	no illness	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	mild illness	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	limiting illnesses	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	severe illness	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	constipation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
18	Feeling (Motivation)	0	no problems, good condition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		1	weak motivation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	strong motivation problems	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	bad mood, no motivation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	constipation	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
19	Daily total																		
20	Fever																		
21	Injuries / Illness	Short description																	
22	Taken medication	Short description																	



Assessment of daily total:

- 0 Points:** Exceptional state of health (or cheated a little...?)
- 1-5 points:** Good condition, no need to worry.
- 6-10 points:** WARNING, continue with the next stage carefully but monitor your own development closely. In the areas where you have points try to take any "counter-measures". This suggests that you may have a mild form of acute mountain sickness (AMS).
- 11-18 points:** ACT NOW! Take a rest day and do not go any higher until your condition improves. Take time to resolve your current Difficulties. This indicates that you have acute mountain sickness (AMS).
- 19-36 points:** ALARM, ACT QUICKLY! Urgent measures must be taken immediately. Descent and/or medical treatment. A severe form of acute mountain sickness (AMS) or severe health problems are present.

